# The CHEMIST

MAY, 1943 VOL. XX, No. 5

*By John J. Loughlin, Employee of The Chemists' Club, New York*

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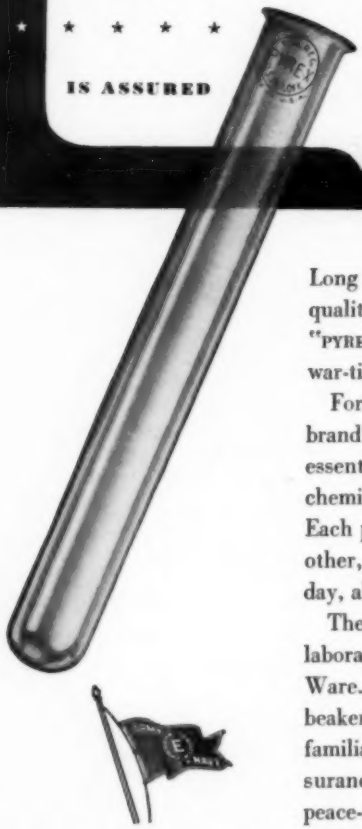

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# *The* CHEMIST

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## The American Institute of Chemists

THE INSTITUTE has achieved a position which will assure its continued growth, as its policy of improving the professional and economic status of the chemist in the social structure is more widely recognized. The active influence of the INSTITUTE in calling attention to proposed legislation which would affect the status of chemists is illustrated by the response to recent articles on the Kilgore Bills and the evident sensitivity of legislators toward criticism.

As chemists become more conscious of the importance of these professional activities, the INSTITUTE will continue to increase rapidly both in membership and power.

Information regarding the INSTITUTE's objectives and activities may be obtained by writing to the Secretary's office.

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## New Officers

DR. FREDERICK A. HESSEL, president of Montclair Research Laboratories, Montclair, New Jersey, was appointed by the National Council to fill the unexpired term of Treasurer. Mr. Walter J. Murphy, who has filled this position so capably, resigned because his duties as editor of *Industrial and Engineering Chemistry* and other publications require him to be in Washington, D. C.

At the annual meeting, the following new councilors were elected: Dr. Donald B. Keyes, Chemical Industries Branch of the War Production Board; Dr. Raymond E. Kirk, Polytechnic Institute of Brooklyn; and Mr. Frank G. Breyer, Singmaster and Breyer. These terms expire in May 1946.

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This issue of THE CHEMIST summarizes the activities of the fiscal year, which ends in May, 1943, as shown by the reports of Committees, Chapters, and officers. Because of limited space, some regular departmental material was necessarily omitted. THE CHEMIST is not published during June, July, and August.

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# Twenty-first Annual Meeting of the American Institute of Chemists, Inc.

The twenty-first annual meeting of THE AMERICAN INSTITUTE OF CHEMISTS was held at the Edgewater Beach Hotel, Chicago, Illinois, on Saturday, May 15, 1943. The members of the Chicago Chapter proved to be most efficient and successful hosts and hostesses on this occasion. Despite travel conditions, the attendance was excellent, both for the meeting and for the banquet in the evening.

The annual business meeting of the INSTITUTE was held in the morning, at which reports of the officers, chapters, and committees were presented. These reports are given in this issue of THE CHEMIST. Dr. Egloff stated that he had visited the New York and Washington Chapters during the year, and had been present at the meetings of the new Chicago chapter. The INSTITUTE has been one of the leaders among scientific organizations in opposition to the Kilgore bill, which is not limited as publicised to a coördination of government bureaus, but which threatens us with political regimentation of science.

Upon motion made and seconded, the proposed changes to the Constitution and By-laws of the INSTITUTE, as sent to the members, were adopted, and in addition it was voted to change the classification of members from Fellows, Associates, and Juniors, to Fellows, Members, and Associates; so that Associates will now be known as "Members", and Juniors will henceforth be called "Associates". Qualifications for these grades of membership will remain as at present. These changes to the constitution and by-laws must be ratified by a mail-vote of the membership, which will be sent out shortly, before they can take effect.

A brief period of silence was observed in memory of the members who died during the year.

The announcement of the election of the following new councilors, who will serve for terms expiring on May 1, 1946, was read: Dr. Donald B. Keyes, Dr. Raymond E. Kirk, and Mr. Frank G. Breyer (reëlected).

Active discussion took place on subjects of interest to the members.

The following resolution was passed:

RESOLVED, that THE AMERICAN INSTITUTE OF CHEMISTS, INC., at the annual meeting held on May 15, 1943, does hereby accept, confirm, and affirm, all of the acts of the Board of Directors and of the National Council on behalf of THE AMERICAN INSTITUTE OF CHEMISTS, INC., during the year ending April 30, 1943.

A vote of thanks was given to the councilors, officers, members of committees, chapter officers, and editor, for the work which they have done in carrying the INSTITUTE forward during the year.

## Afternoon Program

The student medals awarded by the Chicago Chapter for excellence in scholarship to senior chemistry majors in near-by colleges were presented by Dr. Gustav Egloff to the following students: Margaret Dahm, DePaul University; C. Keith McLane, University of Wisconsin; Lee A. Subluskey, Loyola University; Peter Blasco, Illinois Institute of Technology (Mr. Blasco was unable to be present, and the medal was accepted for him by Mrs. Blasco). Student medal awards also went to the following students who were unable to attend this meeting; Peter Cammarata, University of Chicago; Horace R. Davis, Jr., University of Illinois; and Frank Seubold, Northwestern University.

Several papers on the contribution of chemists to certain phases of the war effort were then presented. "Vitamins in the War" were discussed by David Klein, general manager of the Wilson Laboratories; "Petroleum in the War", by Bruce K. Brown, assistant deputy petroleum administrator for war; "Meat in the War", by Herbert E. Robinson, chief chemist of the research laboratories of Swift and Company; and "Synthetic Resin Plastics", by Robert J. Moore, manager of the development laboratories of the Bakelite Corporation. These papers are printed in full elsewhere in this issue of THE CHEMIST.

## Evening Program

The medal of the INSTITUTE was presented to Dr. Walter S. Landis, vice-president of The American Cyanamid Company, at a dinner held following a reception given in his honor.

Dr. Maximilian Toch, president of Toch Brothers, Inc., spoke extemporaneously on "Landis, the Man". Dr. Toch, president of the INSTITUTE during the depression years, reminded his audience that at that

time the INSTITUTE was concentrating on the problem of finding positions for unemployed chemists. The activities of Chemist Advisory Council were outstandingly successful in this respect, and much of its fine work was due to the fact that Dr. Landis was its president. Dr. Toch hesitated to praise the medalist without restraint, because, as he said, "You would look to see if there were not some wings sprouting from his shoulders!" He recounted the experience he had in trying to persuade Dr. Landis to accept the presidency of The Chemists' Club of New York, and concluded, "I wish we had more men like him, and I hope that he will have good health and will grace the chemical fraternity for many long years to come."

Harry L. Derby, president of The American Cyanamid and Chemical Company, spoke on "Landis and His Achievements"; and following the presentation of the medal by President Gustav Egloff, Dr. Landis discussed "The Personal Service of the Chemist to the Nation." Both of these papers appear elsewhere in this issue of THE CHEMIST.

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Dr. Walter S. Landis
and Dr. Gustav Egloff

Dr. Maximilian Toch

By Courtesy of *Chemical Industries*

# Vitamins in the War

***By* David Klein**

*The Wilson Laboratories, Chicago, Ill.*

TO NAPOLEON is attributed the remark that an army fights on its stomach. This is another way of saying that an army must be well fed, if it is to perform efficiently. During the last war, sufficient importance was attached to this subject to cause the formation of a Food and Nutrition Division of the Sanitary Corps of the Surgeon General's Office. A similar unit is now functioning in the present war.

In view of my having served in this branch of the service, commonly called "Food and Nuts", it is of considerable interest to compare the dietary standards of the last war with those of the present conflict. Then, the emphasis was on protein, carbohydrate, fat, calcium, phosphorus, iron and calories. Now it is on protein, carbohydrate, fat, calcium, phosphorus, iron, iodine, and vitamins. Vitamins were omitted from the essentials of a good diet in the last war for one reason only—they were practically unknown. Vitamin research was just beginning to occupy the attention of investigators in this country and abroad. Progress in our knowledge of vitamins belongs to the twenty-five years since the last war, and American chemists have played an important part.

The possibility of scurvy was recognized in the last war, and anti-scorbutic foods considered. In the memoranda issued to Food and Nutrition officers in France, mention is made of the insufficiency of dehydrated potatoes in the prevention of scurvy. Vitamin C was unknown. No mention was made of other vitamin deficiency diseases.

May I digress for just a moment to remark that history repeats itself in the field of dehydrated foods. During the last war, they were not too successful. Potatoes had to be soaked from twelve to eighteen hours to reconstitute something like the customary "spuds", carrots about as long to achieve something that was unpalatable and which the men would not eat. After the war, interest in dehydration waned, only to be revived with the present conflict, where the reasons for dehydrated foods are more compelling than heretofore. Dehydration technology

has improved, better retention of nutritive elements is being achieved, but much more must be learned of dehydrated food conservation with respect to odor, taste and palatability when the foods are stored for considerable time. Chemical forces are operative, even at low temperatures, over long periods of time that impair the value of the products, not so much with respect to their ultimate food value but rather in connection with that intangible, yet most important, factor, palatability.

In addition to supplying the necessary essentials of protein, carbohydrate, fat, minerals, and vitamins, the food dishes must taste good, the men must like them or they will be refused and end up in the garbage can. Numerous examples could be cited of men avoiding certain foods although nutritionally, they were of high value.

This question of the soldier eating the food that is offered has a direct bearing upon the subject of vitamins because thus far, the policy is to provide the vitamins as they occur in the food and not in the form of concentrates in tablets or capsules. The policy of the army is contained in the following quotation.

"Vitamins are essential to the health, welfare and fighting efficiency of every soldier, but it is more desirable to obtain them in their natural form from foods consumed rather than through the use of synthetic products in tablet form. There is no evidence that vitamins in excess of daily requirements are useful. In the event vitamins are required in tablet or capsule form to supplement the ration, they will be furnished in accordance with the following instructions.

"No requisition for vitamin concentrates to supplement the ration should be submitted until a medical officer or nutritionist has analyzed the diet provided from the menu in use. The conclusions of such a review should be based upon the nutritional value of the foods actually available and not merely upon the absence of fresh foods. In the event it is determined that available foods are being properly prepared, served, and consumed, and still a requirement for vitamins to supplement the ration exists, a requisition should be forwarded with a statement that the diet is inadequate and suitable foods cannot be obtained in quantities sufficient to meet vitamin requirements. Specific evidence of inadequacy should be cited. The requisition will state that the surgeon

has approved the quantity required as appropriate for the strength and period involved."

This policy is predicated upon the assumption that:

1. The daily vitamin requirements of the individual are known.
2. The ration in the amounts consumed by the soldier will contain the vitamins that he needs.

What are the daily human vitamin requirements? For those in the audience who are not working in the field of nutrition, the following list contains the vitamins that are generally accepted.

Vitamin A
" D
" C (Ascorbic Acid)
" K
" B Complex
$B_1$ (Thiamine)
$B_2$ (Riboflavin)
Nicotinic Acid
Pyridoxine
Pantothenic Acid
Biotin
Folic Acid
Inositol
Choline
Para-aminobenzoic Acid

In addition, there are apparently several unidentified factors in the B Complex group.

The existence of a vitamin is established by feeding a diet deficient in the supposed vitamin to a proper test animal, producing an abnormality that is corrected by administering the vitamin in question. Time will not permit of the telling of the story of the brilliant work that resulted in the demonstration of the existence of these various vitamins, their concentration and isolation from natural sources, their chemical identification and ultimate synthesis. What concerns us at this moment, is the question: How many of these vitamins are required by the human being? This cannot be answered with a simple numerical figure, because it is a very moot question.

The National Research Council has studied this subject extensively and has set standards for Vitamins A, C, D, Thiamin, Riboflavin and Nicotinic Acid, for infants, children, adults of differing degrees of activity, pregnant women and nursing mothers. The Food and Drug Administration has set standards for these that are somewhat lower than those proposed by the National Research Council. For the other vitamins, standards have not been set because the human requirement has not been established. The problem of arriving at values for the human daily vitamin needs is very difficult. One method used in arriving at present values, the determining of the amount the human being can take before there is an excretion of the vitamin or its degradation products closely resembles the tolerance tests that are used for ascertaining the individual's ability to handle sugar, would appear open to question as a true measure of requirement. It is not clear that the human body must be furnished an excess that is excreted before the daily need is satisfied. This is not merely a theoretical question. It has an important implication when it comes to the fortifying of foods with synthetic vitamins. Are we sure that we are not spending more than is necessary in the fortifying of foods with vitamins?

Although quantitative values have not been set for the other components of the B Complex, their presence in the diet should not be neglected. Particularly is this true of the so-called unidentified factors. The recent work of Elvehjem and co-workers on monkeys is significant. On a diet containing all of the known members of the B Complex, the monkeys were unable to survive more than a few months. However, when this diet was supplemented with various liver preparations, with their unidentified fractions, it resulted in healthy monkeys.

In any event, assuming that the daily vitamin requirements are accurately known, what assurance is there that the soldier is getting this amount in the food he eats? In the first place, it is not necessary that this be done because the human body has a sufficiently large factor of safety, that a daily intake of all of the vitamins is not necessary. In the next place, the amount of destruction of the vitamins is not too well known, when it comes to the various methods of cooking and preparing food. Large losses may occur during the processing of canned

or dehydrated foods. Then there is the further complication of possible losses during storage particularly at the elevated temperatures to which these foods are being subjected in the tropical countries where our soldiers are fighting and where the use of processed and concentrated foods is much greater than in this country. This is a subject that is now receiving considerable attention.

It may be necessary to supplement the diet with concentrated vitamin preparations, but as yet there has been no indication for such a general procedure, in the combat or other areas outside of this country. An exception exists, in the case of Vitamin C. Mixtures containing ascorbic acid are part of the various emergency rations since it is not easy to furnish this vitamin in natural form in a compact product.

There is no vitamin deficiency in our fighting forces, due to faulty diet. Where there is a reduction in the amount of food consumed daily, for an extended period, as in a siege or a shipwreck, vitamin deficiencies may occur. The problem of feeding our millions of fighting men, in so many distant places under so diverse conditions is a gigantic task, but it is being handled very well.

Apart from the use of vitamins in the daily ration, there are medicinal applications of special concentrates of the single vitamins or of combinations. For example, the use of Riboflavin and Vitamin A in night blindness and improving the acuity of vision of our aviators, the use of large doses of ascorbic acid in accelerating wound healing, the use of Thiamine by those taking high carbohydrate diets, the use of multi-vitamin preparations during convalescence, the use of Nicotinic Acid or Amide by pellagrins.

Now, what about the civilian vitamin needs? It has been said that "food will win the war". Our task of supplying food to so many countries, as well as to our armed forces, plus losses in vessels that have been sunk has required extensive food rationing. A curtailment of the amount of food we are allowed does not imply malnutrition. To be sure there may have to be changes in our food habits, but these may be advantageous. Certainly, all of us are more food conscious because of ration points. Herein lies a great opportunity for a nation wide program of nutrition education. There is not likely to be a similar

occasion until the next war. If it is true, as some governmental agencies claim, that this country before the war suffered extensively from undernourishment, now is the time, under war conditions, for nation wide steps to improve the situation, through practical instruction in food values and through the making available of better foods.

As an example of the latter, the fortification of bread with vitamins is an example of a nation wide change in a standard food item, that would not have been possible during peace times. The purpose of this enrichment is commendable, since it seeks to improve the nutritive value of an important food, whose deficiencies were known these many years to anyone who has studied the white flour situation. The great question is whether the method adopted for improving white bread is the best one, or whether it would not be better to change the methods of milling to retain the nutritive elements that are now being removed and which are only partially replaced by the enrichment program.

In bringing this subject to your attention, I would like to consider it solely as a scientific matter. Unfortunately, the problem is complicated by other considerations than just its scientific merits. This is not exceptional in a world that is so largely dominated by feelings rather than facts. It is part of our humanness.

Bread has been called the staff of life. There was a basis for the high regard in which bread was held, when it was made out of whole wheat or a flour not too highly milled. Wheat has been subjected to a vast amount of study and its excellence as a food established. Old fashioned flour had one undesirable characteristic. It did not keep too well. Weevils appreciated its excellent nutritional qualities. By milling the wheat, so that more of the germ and other portions were removed, a flour was prepared that was so nutritionally deficient that weevils did not infest it. Even that flour had a yellow color and so it was subjected to bleaching agents, because there was the connotation that whiteness of flour meant ultimate purity.

As a result the usual flour represents what is left after the removal of a good grade of protein, of most of its vitamin content and much of its minerals. Now, there is being put back part of its vitamin content, thiamine, riboflavin, nicotinic acid and part of its minerals, iron. The enrichment does not give to the flour all that was removed.

The obvious question is: If this is true, why not mill wheat so that the flour will be nutritionally adequate, without first making a poorer flour and then going to the trouble, and expense of fortifying it with synthetic vitamins.

The scientific answer is, of course, mill the wheat to make the best flour.

The practical situation is quite otherwise for a variety of reasons. More difficult problems have been solved in this country. This one can also be solved, particularly under the present war conditions. There has been too little public discussion of it, in this country. In England, the situation has been quite the reverse.

In contrast to the lack of public information on the white bread problem, there has been no dearth of publicity with regard to vitamins, issued by a variety of agencies. Claims are made for their value in preventing colds, other scientific reports drawing opposite conclusions. Data are submitted to show increased efficiency and manual output when extra vitamins are taken daily, whereupon other data controvert this claim.

There is a real need for accurate information on the part that vitamins play in the nation's health and war time output. Under any circumstances, in war or peace, the first consideration must be given to the health of the individual. Under war conditions, with the shortage of physicians, now reported at less than one per 1500 people and probably growing worse, it is our patriotic duty that we as individuals make every effort to remain in a good state of health. Food rationing per se does not cause lower public health. If the reports from England are true, the general state of health is better there than before the war. There is no reason why the same may not be said of this country. It depends upon sound food rationing, proper public instruction in food values, food preparation, and willingness on the part of the public to change some dietary habits.

# Petroleum in the War

***By* Bruce K. Brown**

*Assistant Deputy Petroleum Administrator,*
*Petroleum Administration for War*

UPON reviewing the program sent to me some weeks ago, I was intrigued by the similarity of titles for three of the addresses to be given at this gathering, "Vitamins in the War," "Petroleum in the War," and "Meat in the War." "Let us see," I said to myself, "what *is* the common denominator for these commodities?" "Before plunging into an account of the specific rôle of petroleum in the war, illustrating how it differs from the parts played by Vitamins and Meat, what can be said as to the similarities of the problems?"

And so, in preparing my remarks, days before coming here and in complete ignorance of what my fellow speakers will actually say, I reached the conclusion that Petroleum, Vitamins and Meat have much in common, insofar as the war is concerned.

There is a shortage of meat in the United Kingdom, due to the fact that the British draw their peacetime supplies of meat from other countries and the war has severely taxed their transportation system and cut off most of their normal supply sources. Consequently the United States must supply more and more meat to the British and to other United Nations. Exactly the same is true of petroleum. I assume that the same is true of vitamins also, particularly since they, in a sense, serve to augment diminished rations of foodstuffs.

Our fighting forces and those of our Allies require large supplies of meat, and its shipment overseas makes for a shortage here—the shortage with which all of us holders of the little red stamps are so familiar. Our fighting forces and those of our Allies also require tremendous supplies of petroleum.

Two-thirds of the total tonnage required to support an expeditionary force (including, of course, the fuel oil required to operate the cargo ships and their protecting war vessels) is made up of petroleum and its products. We have a petroleum shortage in this country paralleling the meat shortage. As yet, the real petroleum shortage is confined

mainly to the East Coast and it is caused mainly by transportation dislocations; but to Easterners it is just as vexing a shortage as the meat shortage.

The producers of meat are distressed because the cost of producing meat has risen in spite of the national effort to stabilize prices and, at the same time, the enforcement of ceiling prices makes the production of meat less profitable. The same thing is true of petroleum and the similarity can be pushed further in that it takes several years to find, develop, transport, refine, and distribute petroleum from newly-found oil fields just as it takes several years to build or rebuild herds of cattle; and an unwise decision made now affects output several years hence.

The agencies of Government responsible for petroleum are concerned over the lessened productivity of crude oil due to various war causes and I know that the same concern is exhibited by the agencies of Government responsible for our meat supply.

One of the principal recognized difficulties in the maintenance of an adequate supply of petroleum for war is the shortage of manpower, and the same is true of meat.

I have the impression that the production of vitamins is increasing by leaps and bounds and that this vital war activity has not, as yet, been much impaired by price and manpower problems. However, I am sure that vitamins and petroleum has much else in common. For example, under the pressure of wartime demands, the technology of petroleum refining is advancing each month about as much as it would be expected to advance in a year of peace, and I believe that the technique of producing and using vitamins is making similar progress.

I have poached on the preserves of my fellow speakers to point out what I deem to be a fundamental concept which is lost sight of all too often, namely, that many of the problems which war imposes are common to all people and all industries. War demands an accelerated rate of production. Under the pressure of circumstances and the fervor of patriotism in a community of free men the impossible becomes merely the difficult, and whetted ingenuity forces technological advances at an accelerated rate. Economic dislocations impair the productive mechanism and threaten to wreck it. Transportation becomes the bottleneck and the diversion of transportation to the military effort results in a

shortening of the civilian supply. Finally, the tremendous increases in the demands for manpower and womanpower make all problems of all sorts more difficult.

I have already indicated some of the main problems which plague the petroleum picture and I know that you, as chemists, are interested primarily in the scientific aspects of the rôle of petroleum in the war. However, before discussing the technology of petroleum munitions I should like to give you a further more specific report on the wartime economy of petroleum as I see it, since an appreciation of the base upon which we must carry out our war program will permit you to draw your own conclusions as to the job that is being done.

First, as to the supply of our basic raw material—crude petroleum. We produce in this country about 4,000,000 barrels per day of crude oil and in peacetime we use it at the same rate at which it is produced. We have proven reserves equivalent to some twenty years' requirements although we might not be able to raise it above ground as rapidly as desired. So far, so good. However, there are other disturbing factors. In our actual day-to-day production of crude oil, we must remember that individual oil wells, like people, are born, go through a productive period, decline, and die. To maintain an even flow of crude oil from our proven fields we must keep drilling new wells, year after year. We need steel for drilling machinery and for oil well casings and tanks and gathering lines. But steel, too, has gone to war and it has been very difficult to secure enough of the materials needed for oil well drilling. Further, as the military services expand in size, manpower for the drilling of new wells becomes more difficult to obtain. The petroleum business has been conducted with private capital in search of a profit and, despite the growth of large integrated companies, we still rely primarily on the individual operator—the entrepreneur—for the opening of new fields. The individual prospector has become somewhat discouraged. Not only is he disturbed about the shortening margin for profit between the gradually increasing costs of operation and the ceiling prices of crude oil which were fixed long prior to Pearl Harbor, but he has a new worry and a new deterrent—very high income taxes. Drilling oil wells is a hazardous business and unless the chance of profit is large the man with money would prefer to put it in a safer

place. As one independent producer puts it—"In a game of roulette you can bet on the red or the black and if you win, you double your bet. Or you can bet on one of the thirty-six numbers. The risk of betting a chip on one number is very great but if you win, you get thirty-five chips. Drilling a well is like betting on a number. The chances of a dry hole or an unprofitable well are great. Now that taxes have gone up so much if I drill a well and find oil, I no longer get paid off on the number. Uncle Sam takes most of the chips. I might as well bet on the red or the black."

Another of our difficulties in maintaining crude oil production arises because more than a quarter of our oil comes from "old wells" operated at a considerable expense with a very small margin of profit and the operators have been caught between the fixed ceiling prices on crude oil and increased operating costs. While production of crude oil has thus far been sustained at a rate only slightly less than that which prevailed before the war, the trend is downward, and in spite of a vigorous hunt for new reserves, the experimental activities of the past few years have failed to locate new reserves of oil at the same rate that we are consuming oil.

I may remark, also, that the scientific search for oil involves physicists, electrical experts, seismographers and other scientists, many of whom are required in the military and naval services for aircraft detection, submarine detection, and similar activities. The scientific search for oil is largely a young man's science and the young men are at war.

The none-too-satisfactory situation surrounding our supply of crude oil is accentuated because pre-war imports of crude oil and fuel oil from South America have been largely cut off due to difficulties of tanker transportation and diversions of tankers to Europe, and the demand for petroleum products out of our refineries has tremendously increased.

The existence of war has not shortened up any civilian demand for petroleum products except to the extent that the temporary rubber shortage has diminished gasoline consumption and—over all—that reduction has been less than twenty per cent.

There are certain forces at work which should tend to diminish civilian requirements but they are uncertain and slow moving. The mere transfer of millions of men from civilian life to the Armed Services

should shorten civilian demand eventually, or at least transfer the demand from the civilian population to the military—but it does not seem to work that way very fast. Men leave home, to be sure, and they leave their automobiles at home. But the home remains to be heated and lighted and the car remains in the possession of a family which usually has several drivers available. Cars will wear out but the average useful life of an automobile used to be deemed to be seven years, even in the heyday of peace, and with the care that automobiles are now receiving, they will die off very slowly, even though no more are made until peace comes.

And on all other fronts the demand for petroleum has increased. More factories, more shifts per factory. More lubricants as the machines operate more hours. More workers who must travel by automobile to war plants located apart from other means of transportation. More modern homes. More railroad traffic and no time for materials or mechanics to be spared to convert oil burning locomotives to coal. More fuel oil for more cargo ships. More fuel oil for our Navy as it covers the seven seas. More coke for more aluminum. More wax for packaging. High quality fuel and lubricants for our mechanized ground forces and those of our Allies. More aviation gasoline than it was dreamed could ever be needed and more than it was dreamed could be made. Fuel for incendiaries and flame throwers. Toluene for TNT. Butylenes for butadiene.

In spite of increased demands for petroleum products, in spite of the thus-far-solved problem of maintaining a supply of raw material, and in spite of the difficulty in producing tremendous quantities of special products in the face of the shortage of materials to construct the necessary new equipment, the prime problem to be met in the petroleum field in this war is that of transportation. Transportation difficulties are the root of most of our troubles and their solution is an absolute requisite to Victory.

During the last twenty years the phenomenal increase in the use of petroleum products, both gasoline and fuel oil, was accompanied by a search for methods of transportation which were cheaper and more expeditious than the ubiquitous railroad tank car.

In the interior of our country there was a great extension of pipe

lines pumping crude oil from the oil fields to refineries near centers of population. Product pipe lines, capable of conveying tremendous quantities of gasoline and other light petroleum products, were constructed between refineries adjacent to oil fields and other large centers of population. Those railroad tank cars already available continued to be used in a desultory fashion to help out in areas where no better means of transportation were available but automobile tank trucks were built to compete with them and to absorb the increase in business.

On our coasts there was a tremendous increase in the use of a form of transportation which many think is the cheapest and best—tankers. The thirty-odd millions of people inhabiting our Eastern Seaboard were served with petroleum almost exclusively by tank ship. The relatively small oil fields in the East helped out and a few pipe lines were in service but most of the crude oil refined in our eastern refineries was brought to them from the gulf or from abroad by tank ship. Further, the capacity of East Coast refineries to manufacture petroleum products is capable of satisfying only a minor part of the demand and other tankers brought gasoline, kerosene, fuel oil, and other products from our Gulf Coast refineries to our eastern ports. In June, 1941, our Eastern States which make up Petroleum Administrative District Number 1, received daily, from sources other than its own oil fields, about 1,600,000 barrels of petroleum in all of its forms and less than 100,000 barrels per day was brought by transportation means other than tank ships. The amount brought in by railroad tank car was negligible as well it might be when you consider that it cost several times as much to move it that way. Upon the outbreak of war the tank ships were gradually diverted from that service to other more important services and the East Coast was in a desperate plight. There were something over 100,000 railroad tank cars available in the whole country and 70,000 of these (all that the rails and locomotives can handle as a practical matter) were diverted to the service of hauling petroleum to the East. West bound pipe lines were reversed, barges were built, new pipe lines were built and now—in June or July, 1943— we hope that we can move daily to the East Coast almost as much petroleum as we did before the war. Practically none of it will move in tankers.

This remarkable revolution in transportation, necessary as it was, has

not cured anything. As to the East Coast, it is still relatively short of petroleum because out of its stocks it must support the war in Europe and Africa and in the Atlantic. The supplies reaching the East Coast are still carried and must continue to be carried to the extent of half or more in these same railroad tank cars. The removal of the tank cars from the interior of the country has created an entirely new transportation problem for the interior. It must do without tank cars for its local distribution and, at the same time, it must send refined products eastward in such tank cars as are made available.

The shortage of transportation makes a peculiar pattern for refining operations. Some refineries make vitally needed war products such as 100 octane aviation gasoline and its ingredients. These refineries must be kept running at all costs. This means that the war products refineries on the East Coast must have the first call on crude oil transported into the district and the war products refineries on the Gulf Coast—which have a plentiful supply of crude oil in the vicinity—must have the first call upon available transportation, because unless the products which they refine are hauled away they, too, must shut down. In order to maintain adequate supplies of petroleum products in the interior without recalling tank cars from the East Coast Service, it is necessary that all crude oil pipe lines and gasoline pipe lines in the interior be operated to move petroleum generally northward and eastward at full speed. Refineries on product pipe lines must be served with crude oil and must themselves serve the product pipe lines and barge lines lest some community run short of oil. Throughout the country the oil companies must operate largely as one insofar as their distributive mechanisms are concerned. Should they not do so shortages would develop in some areas immediately.

In mobilizing for war the petroleum industry has done much more than pool its supply of crude oil and its transportation and distributive equipment. It has pooled its technical manpower and its processes. Pre-war patent squabbles have been patched up or forgotten. Royalty rates on new processes have been sharply reduced and in some cases patents have been dedicated for the period of the war. Carefully nurtured recent processes and "technical know-how" have been shared. Industry committees and technical sub-committees operating with Department of Justice approval under the Petroleum Administration for

War are exchanging technical information. Refining committees develop and submit information upon which the Petroleum Administration has ordered them to make less of their "money crop"—gasoline—and more fuel oil, or to run less or more crude as the Nation's welfare may require.

An Aviation Gasoline Advisory Committee composed of carefully selected technologists from many companies works practically full time for the Petroleum Administration reviewing all data and all operations of all companies to eke out the last barrel of product. There is a similar committee for aviation lubricants. There are many other such committees for butadiene, styrene and toluene. The Technical Committee of the Petroleum Industry War Council is staffed with the leading petroleum technologists of the country and supported by their respective staffs. It is available for work on all sorts of new developments. Under the guidance of this Committee, fourteen petroleum companies expended over a million dollars in special researches on butadiene within a period of five months last year.

The petroleum war product of most compelling interest is, of course, 100 octane aviation gasoline. The story of 100 octane is difficult to tell here and now because it is so hedged in with secrecy restrictions both as to the quantity and manner of production and the processes used and qualities obtained. I will do the best I can within the limitations of information which has already been authorized for publication.

It is common knowledge that before the war we had an estimated national capacity to produce 40,000 barrels per day of 100 octane gasoline and part of this capacity was shut down for the want of buyers. By the Spring of 1942 authorizations had been given to increase this capacity many-fold but a paper authorization is quite a different thing from a new plant. We have had a great difficulty in blasting loose the priorities and actual construction materials to build new facilities for 100 octane gasoline but that phase of the matter has been so well publicized lately that I shall dismiss it without further comment.

Getting back to the grass roots, 100 octane gasoline is composed of three main ingredients and numerous special ingredients. The bulkiest ingredient of 100 octane gasoline is called, logically enough, "base stock" and it is in reality nothing more than a very special quality high

octane gasoline. A second ingredient which provides practically no bulk at all is tetraethyl lead fluid. Mixing base stock and the permissible quantity of tetraethyl lead will produce a fuel of a very high octane number—but not 100 octane. The base stock gasoline may be a selected and specially fractionated natural gasoline or a gasoline produced by cracking—usually catalytic cracking. The higher the octane number the better. The higher the aromatic content (within limits) the better.

The third main ingredient is an iso-octane or a mixture of iso-octanes. We call it "blending agent." The higher quality the base stock is the less blending agent is required—and vice versa. The iso-octane blending agents are obtained, mainly, by two methods—both of which require olefinic hydrocarbons which, in turn, are by-products of the cracking of petroleum. The favored blending agent is the so-called "alkylate" which is obtained by alkylating iso-butane with olefinic hydrocarbons—usually but not necessarily butylenes. The other blending agent is produced by polymerizing butylenes to what we call "codimer" and then hydrogenating the codimer to produce "hydrocodimer" or something akin to iso-octane.

Prior to the war there were few catalytic cracking units in operation and they were used primarily to produce high octane motor gasoline. Butylenes produced as a by-product of thermally cracking or catalytically cracking oil were polymerized—usually with other olefines—in a manner to produce a high octane mixed polymer useful in motor gasoline, but sometimes to produce codimer for iso-octane. Pre-war 100 octane gasoline was mainly produced by mixing iso-octane or alkylate with selected natural base stocks and tetraethyl lead.

Prior to Pearl Harbor there were about a dozen manufacturers of 100 octane gasoline and these manufacturers operated a total of about twenty-three separate special units which we rated as 100 octane units.

In laying out plans to increase the production of 100 octane gasoline by the erection of new facilities the industry, with the approval of Government, concluded that the most feasible course to follow was to build catalytic cracking units to produce base stock (natural base stock being limited) and at the same time to produce olefines for alkyate and to augment the supplies of isobutane naturally available. Butane isomerization units and alkylation units, using either sulfuric acid or hydrofluoric acid as the catalyst, were also necessary.

These new facilities take more than a year to complete and difficulties in obtaining materials have extended the period. Nevertheless, by April, 1943, the number of main units in operation had increased from twenty-three to forty-two and it will reach sixty before the summer is gone—with more to follow.

In spite of these difficulties the national output of 100 octane gasoline was more than tripled in a year. Only a small part of the increase came from some new facilities started before Pearl Harbor. A part of the increase came from an increase in the permissible amount of tetraethyl lead but this was offset, in a way, by a much-needed improvement in "rich mixture quality" achieved in the face of extreme difficulty. Pre-war polymerization units and similar equipment in some fifty refineries, many of which had no other connection with the 100 octane program, were impressed into special service to make special ingredients. Every existing facility was forced to its utmost production. Pre-war catalytic cracking units were converted to aviation service. The Petroleum Administration, aided by advice from the best technologists of the industry, directed the blending of base stocks, blending agents, and other ingredients on a national basis. For example, some pre-war manufacturers of 100 octane gasoline "went out of business" as such temporarily because it was found that their blending agents made more 100 octane when mixed with the base stocks of other companies rather than their own. Isobutane, needed on the West Coast, was shipped from Philadelphia. 100 octane blended at an eastern city has components shipped from Chicago and others from Texas—because we can get more barrels of product that way.

One of the most interesting phases of the program is its kaleidoscopic change from month to month. New catalysts are developed and units still in process of construction must be adapted for their use. New techniques produce better base stock. New techniques permit greater yields. New ingredients of high quality make it possible to dilute the product with base stocks formerly thought unusable.

Measured in relative volumes, the petroleum industry's contribution to the synthetic rubber program is much smaller than its aviation gasoline activity. One third of the butadiene needed in the synthetic rubber program is to be produced from alcohol and the remainder from petroleum. Part of the petroleum butadiene will come from dehydrogenating

butane and part of it by the cracking of gasoline but most of it will be produced by dehydrogenating butylenes obtained from the catalytic cracking units which form a part of the 100 octane program as well.

The exact figures are 220,000 tons of butadiene per year from alcohol, 250,000 tons from butylenes, and 186,680 tons from butane or gasoline. However, if *all* of the butadiene were made from petroleum it would amount to only about 16,000 barrels per day of butadiene and could be made easily from less than 25,000 barrels of butylene. These figures are small figures compared to a daily crude oil consumption in refineries of 4,000,000 barrels per day or a pre-war consumption of 1,600,000 barrels of motor gasoline per day.

However, barrelage figures are deceptive. The synthetic rubber program is a tremendous one from the standpoint of technique and the processes used are, for the most part, newer and more difficult than those used in the 100 octane program. Further, the synthetic rubber production program was later starting than the 100 octane program, particularly from the standpoint of ordering equipment.

To me the most interesting feature of that sixty per cent of the synthetic rubber program which is dependent upon petroleum refining for its prime raw material—butadiene—is its utter inter-dependence with the 100 octane program. You have heard much over the radio and have read much relatively unenlightened comment about the "competition" between the synthetic rubber program and the high octane program for construction materials to complete the projects. Too little has been said to bring out the fact that there is an intimate process relationship between the two programs and that the rubber program succeeds only to the extent that the feed stock units which supply it with butadiene or raw materials for butadiene and which also make 100 octane gasoline or its ingredients are successfully completed and operated. Personally, I have no doubt of either.

The third main war product of the petroleum industry is toluene and most of it is being made or will be made by slight catalytic conversion or so-called "catalytic reforming" of selected naphtha in the presence of hydrogen. Such units must be operated as integral parts of refineries and any excess aromatic hydrocarbons which they produce become immediately useful in aviation gasoline.

# Meat in the War

**By H. E. Robinson**

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EFFICIENCY is the keynote of modern living and correspondingly of modern warfare. The old adage which claimed certain victory for the one "who gets there firstest with the mostest" was never more true than it is today. The relation of food to warfare has assumed a certain prominence ever since the day that Napoleon first stressed the importance of food to a successful army campaign. Prior to the present world conflict not too much thought had ever been given to applying the principle of a health building and morale maintaining diet for civilian workers.

There have been any number of analyses of the food situation in Germany during World War I. Most of these seem to indicate quite clearly that one of the major reasons for the breakup of Germany was the failure in food supply and consequent poor nutritional status of the war workers on the home front.

It is certain that Germany took cognizance of this fact in preparing for World War II. It is known that Hitler prepared huge stock piles of the most critical food materials as carefully as he prepared stock piles of the raw materials for the implements of war. This thoughtful planning on the food front, which was designed in Germany this time for the war workers at home as much as for the soldier at the front, has made an economic and food blockade of the German empire much more difficult than it was in the first World War. Many observers have been inclined to believe that it would be next to impossible to starve Germany out of this war. Certainly the United Nations also are well aware of the importance of a carefully planned food economy in a victorious war effort.

Efficiency in a war worker or in a soldier depends largely upon maintaining a state of good health and a condition of high morale. The sciences of sanitation and immunology are so well developed and so widely practiced that they are not the limiting factors in maintaining physical well-being that they were in previous war times.

Meat supplies are short, both for our adversaries and for our allies. In some instances these shortages are of such proportion that they definitely impair the nutritional value of the food supplies for both war workers and soldiers. In other instances the shortages occur primarily with the civilian population from the standpoint of dietary satisfaction. In order to provide properly for our army and to be of some assistance in supplying meats to our allies, as well as to assure a fair distribution of domestic supplies to promote the national health, some program of meat sharing has been essential.

An excellent summary of the present meat situation, particularly with regard to civilian supplies, is found in a publication of the Bureau of Agricultural Economics. On page 11 of "The National Food Situation" for April 1943, there appears the following statement:

*"Meats*

"On the basis of the initial point values (for rationing) and other supply control features of the program, it is estimated that the average ration of meat for individual consumers will be in the neighborhood of 2 pounds per week (retail weight), which is equivalent to an annual per capita consumption on a dressed weight basis of about 120 pounds. This is roughly 20 pounds per person less than the high rate of consumption reached in 1941 and 1942, but it is only a little less than the average for the 5 years 1935-39 when the meat supply was more unevenly distributed than it will be under rationing.

"The total output of meats in 1943 will greatly exceed the 1935-39 average production—perhaps by as much as 50 per cent. However, most of the increase over that period is being absorbed by the large war requirements of our armed forces and of our allies. An added reason for the reduction in the civilian meat ration in relation to the high average consumption of the preceding 2 years is that marketings of livestock for slaughter in regular commercial establishments currently are running below expectations based upon the production of live animals. This has been due in part at least to a larger than usual local slaughter and to black market operations. Action taken recently by the Department of Agriculture to license

livestock slaughterers and dealers and by the Office of Price Administration to control black markets should help materially to improve this situation."

In general, it will be possible under the present sharing program to provide adequately for the strict nutritional needs of the average American citizen. So much has been said and written about the present day army diet that little need be mentioned here other than that it is uniformly excellent. It might be worthwhile to consider, at this point the most fundamental assumptions of good nutrition, which are based on three primary facts:

(1) The established dietary must satisfy hunger.

(2) Regardless of caloric content or of nutritional quality, the dietary must have appetite appeal and satiety value. No man has yet come to the point of accepting what is good for him unless it is first of all good to his taste. Closely related to this aspect of practical nutrition is the satisfaction value of the diet, as well. The fellow who is digging a ditch or sawing lumber and needs about 6,000 calories per day, speaks in terms of the food "sticking to his ribs". The war worker and the soldier are both in this category, and neither can maintain strength and skill if their food has not been such as to give a feeling of satisfaction which lasts from one meal to the next.

(3) Scientifically, of course, the nutritional quality of the dietary is of most fundamental importance. Practically, the principles of hunger value and of appetite appeal must be satisfied first. The easiest way of assuring high nutritive quality is to build a dietary upon the protective, or more properly stated, the foundation foods.

The major concept about nutrition in Warld War II is that concerning the foundation foods. In World War I, nutrition had advanced only to the point of considering primarily caloric or energy requirements of the soldier and civilian. In order to properly consider this new concept of nutrition it might be well to delve just a bit deeper into fundamental nutritional factors.

It is difficult to properly evaluate food planning which will lead to a

state of optimum health through good nutrition without considering a little bit about the five groups of basic food nutrients—proteins, fats, minerals, vitamins, and carbohydrates. Nutritional research on these nutrients has occupied thousands of laboratories during a large share of this century. Publications on the research findings of these groups must run well into millions of pages. Any short digest of this voluminous information is obviously impossible. However, a few of the most important food facts about these nutrients can be gleaned.

### The Importance of Protein

The term protein has been derived from the Greek word meaning "of the first importance". Man is essentially a mass and a maze of protein material distributed about a framework of minerals. Plants make their own protein from the minerals and nitrogen of the soil, the carbon dioxide of the air, and the energy of activation supplied by sunshine. With the exception of ruminating animals, man and other animals must obtain the protein necessary to build and maintain their body tissue from the food they eat. Cattle and sheep appear to be able to utilize the proteins synthesized by certain bacteria which are present in their stomachs.

Nutritionally, the most important factor to recognize about protein is the great difference that appears in the quality of protein as between plant and animal sources. The proteins of the highest biological value are those which are derived from foods of animal origin, such as meat, milk, eggs, fish, fowl and cheese.

The significance of this point has been emphasized by such investigators as H. H. Mitchell, of the University of Illinois, who has made the following statement in his book "The Biochemistry of the Amino Acids": "The importance of animal proteins in the American diet appears to reside as much in the extent to which they improve utilization of inferior cereal proteins, as in their own nutritive excellence". Dr. James F. McLester in his book "Nutrition and Diet in Health and Disease" has likewise stated, in referring to the quality of protein food: "By good is meant proteins or protein mixtures which are of high biological value, in which the proteins of meat or milk, preferably of both, find first place".

Protein does even more than furnish fuel and material for tissue

rep'acement; it appears to have a definite relationship to stamina and a stimulating effect upon vigor and general physiologic efficiency. The protein value of a food depends upon three factors:

(1) The amount of protein contained in the food;
(2) The completeness with which it is digested; and
(3) The quality or the biological value of the protein.

The foods which are of animal origin are the only ones which completely fulfill these criteria of high protein quality.

The largest single contributing factors to energy in the dietary are the fats. The ability of the body to maintain heat or do mechanical work depends upon the number of calories supplied by the diet. Since fats supply on a moisture-free basis approximately 2¼ times as much energy per unit of weight as do any of the other nutrients, it is these foodstuffs which are most critical in times of severe food shortages. The average diet depends upon fat for at least 25 per cent of its caloric value. Fats are also the only source of the essential fatty acids now considered to be linoleic and arachidonic acids. These materials were first termed vitamins because of their particular necessity in the growth of the young and for the prevention of certain types of skin diseases. With the establishment of their chemical identity, the vitamin terminology was dropped. Another important function of fats in the diet is that they are more thoroughly digested and absorbed than other food constituents, thus furnishing concentrated energy over a longer period of time and fulfilling one of the important musts of good practical nutrition—the maintenance of a feeling of satisfaction. In World War I, calories in the diet was the major nutritional factor. In the present conflict, this is only one of the many important nutritive considerations.

The importance of mineral elements is evidenced in the fact that the teeth and the bony structures of the body are as dependent upon minerals as is a modern tank or gun, but minerals go much farther than merely provide structure. Calcium, phosphorus, magnesium, and trace elements, which are found principally in the bony structure, function in almost every activity of the body's makeup. Iron, copper and possible other trace elements such as cobalt are essential to the formation and maintenance of a proper hemoglobin supply. A list of some twenty or more

minerals seems essential to the proper maintenance of efficient good health.

More volumes have probably been written in the past 15 years on the importance of vitamins in the diet than on any other single class of nutrients. Actually, these materials can be relegated to no greater importance than that of minerals and fats. They are really accessory food substances which play an integral but not a paramount role in good nutrition. All of the vitamins have certain common functions and are equally indispensable. The major factor of difference is that some of the vitamins are more likely to be deficient than others, either through a lesser distribution in common foodstuffs or through greater susceptibility to destruction in the ordinary processing, storage and cooking of foods. Each of the vitamins has some special function which it plays, and it is to these special functions that the most publicity has been given. This is in some respects unfortunate in that it has led people away from the first consideration about these food factors which is that they must be considered as a team and in no instance as a single unit. A deficiency of any one vitamin throws off the entire mechanism of the body. An excess of any other vitamin does not particularly help to repair the damage.

The foundation foods are those foods which supply, in greatest amount and in best quality, some or all of the food nutrients most discussed. On this basis, the foundation foods may be grouped as

Meats and Meat Products;

Milk and Milk Products;

Fruits;

Vegetables;

Enriched or restored or whole grain breads, flours, and cereals.

The modern dream of good practical nutrition is that there shall be supplied in every day's diet to every man, some of each one of these foundation foodstuffs. After this supply has been obtained, then good nutrition says eat anything else you particularly like. It is obvious that an infinite variety of combinations is possible from the hundreds of individual food products which are present in these five foundation

food groups. Proper marketing and selection will maintain a variety; intelligent food cookery or food processing will maintain the nutritive quality of the products; and studied servings and appealing food preparation will maintain taste and appetite appeal.

Meats and meat products are listed first among the foundation foods because of a predominance of the factors which go to make up applied good nutrition. These nutritive qualities in meats and meat by-products may be briefed as:

(1) Meats are primary food materials for the satisfaction of hunger and for satiety value. Meat is the basis of meal planning and the basis of after-satisfaction with the meal.

(2) The protein content of meat is of high biological value and as such the proteins of meat not only meet all of the requirements of this nutrient of first importance, but also serve to supplement and thus economically utilize the less complete proteins which are derived from the cereal grains, fruits and vegetables.

(3) Meats are in general the most important food sources of the many important vitamins of the B-complex, including such better known factors as thiamin, niacin, riboflavin, pantothenic acid, as well as vitamins which are at present less well established as to human requirements and metabolic function.

(4) Meats and meat products are primary suppliers of phosphorus, iron, copper, and a host of the trace elements whose entire function in nutrition has yet to be determined.

(5) The appetite appeal and flavor value of meat meets most adequately the second cardinal principle of nutrition which deals with food acceptability and desirability.

Milk and milk products are excellent sources of proteins, minerals, vitamins, and fats. Fruits and vegetables are primarily valuable foundation foods because of their rich contribution of vitamins and minerals. Enriched, restored or whole grain breads, flours or cereals are primarily economic sources of food energy but, likewise, supply important amounts of the other nutrients.

The meat packing industry had, in general, established a well functioning disassembly line long before the automobile companies so successfully

reversed the process. In this war, even further stress has been placed on efficiency in the meat packing industry in order that it might meet the double problem of supplying a fair share of meat to the armed forces and to our allies and of providing a fair measure of good nutrition for all of our war workers.

**World Meat Situation**

Before discussing the problems and obligations of the meat industry which have arisen primarily because of our participation in World War II, it might be well to consider for a moment the present world meat situation. In some countries, land, labor and grains may be needed more desperately for other purposes than the raising and feeding of meat animals. The most urgent need of meat is for its high supplementary value to the cereal, fruit and vegetable foodstuffs. In normal times all nations relied upon their own capacity to produce a large share of the meat they consume. The United States, Russia, China and France normally are quite self-sufficient insofar as importation of meats is concerned. There is some doubt that Russia had enough meat to properly meet her huge army's requirements, even before she lost the Ukraine. China has never been on a plane of high nutrition. Certainly, the demands of war time have increased the needs of this nation for meat, far above normal. The situation in Great Britain is quite the opposite in that about one-half of her meat supplies were ordinarily imported. The British Isles drew beef from Argentine, Brazil, Uruguay, and Australia; ham and bacon from Denmark and Canada; and lamb from Australia and New Zealand. Submarine warfare has greatly reduced the supplies of these meats which Great Britain normally received from South America and the Dominions. The contributions of Denmark, Holland, and Poland were, of course, completely stopped. The livestock feeding situation in England has also served to decrease home production. So Great Britain has increased her meat imports from Canada and South America and has drawn heavily from the United States' supplies under the lend-lease program. South American countries continue to export their available production insofar as shipping is available.

Australia is providing meat for the British forces in the Egyptian

campaign as well as for its own and the United States forces in Australia and in the Southwest Pacific.

New Zealand has maintained almost normal shipment of dressed sheep and lambs to England but this requires space which may not continue to be available.

Canada has quadrupled her peace-time rate of pork exports to the British Isles through a coöperative program between the farmer, the meat industry and the consumer. Pork production in Canada has more than doubled since 1939, while Canadians have at the same time reduced their own use of pork. As you undoubtedly know, Canada has just instituted a meat rationing program, to take effect about June 1.

Since Germany is practically unable to extend her meat supplies by importation from other than conquered countries, the situation there is far worse than that of any of the United Nations. In practically every country under German domination, local production of feed has been reduced because of the necessity of using land and resources for carbohydrate human foods, such as potatoes, sugar beets, and cereals. Meat production in Denmark, Holland and Belgium has been tremendously impaired from a lack of imported feeds and cereal grains.

Since the first shipload of lend-lease food arrived in Great Britain on May 31, 1941, nearly two billion pounds of pork and a billion pounds of lard have been purchased by the Agricultural Marketing Administration. The Bureau of Agricultural Economics has stated that military and lend-lease uses will be allotted 20 to 25% of the prospective 1943 food production in the United States. A consideration of lend-lease food shipments indicates that the United States is now supplying about one-fourth of Great Britain's total requirements for meat, eggs, butter, and cheese, in addition to very substantial shipments to Russia.

American meat packers have been particularly faced with the problems of perishable food transportation. The meat industry has been coöperating throughout the war with the U. S. Department of Agriculture and the British Ministry of Food in economizing on space through newer methods of packing and shipping.

One of the most recent and most effective of the new developments is that concerning the dehydration and compression of meat.

During World War I, pork was sent to Great Britain mainly as cured

Wiltshire sides in the holds of refrigerated ships. It was realized early in the present war that there would not be sufficient refrigerator ships available to carry all the pork needed by our allies. This was because other perishable foods also required low-temperature shipping space, and enough special boats of this type could not be built within the limitations of time and materials. It was, therefore, necessary to create a means of supply that would put more meat into the ships we have.

By midsummer of 1942, one of the large meat packer's operating and research departments had developed and tested a method of preparing meat for overseas shipment which was radically new in the field—dehydration. Developed successfully first on beef, the process made it possible to fill the United States Government's first order for dehydrated meat. Even larger orders for dehydrated pork, for shipment to allies abroad, have followed.

Dehydrated pork is a wholesome, light nut-brown colored granular product which contains a maximum of 10 per cent moisture. When properly packed and vacuum sealed, it has good keeping qualities. It does not need refrigeration from time of packaging until used.

In this process, lard is produced as a separate product. This is derived from the fat which is a part of the meat in the Wiltshire side. The net result of this process is, therefore, two products: dehydrated pork and lard, requiring less than one-third of the shipping space needed for the same amount of pork in Wiltshire sides. In other words, all the meat that was shipped as cured sides in 10 vessels can now be reduced to the form of dehydrated meat and lard which requires only 3.12 ships. The lard takes up 1.12 boatloads, while the dehydrated pork requires only two boatloads.

Dehydrated meat is compressed in packing without destroying the characteristic resiliency of meat tissue. The meat industry has thus been able, in consultation with the United States Department of Agriculture, to cut the requirements of shipping space for pork and lard by almost 69 per cent.

Dehydration is accomplished by cooking fresh cubed meat, grinding it into fine particles, and drying the granules slowly and evenly. The process is a continuous operation under controlled temperatures.

Addition of water gives the product a consistency like that of freshly cooked ground pork. In that form it can be further prepared and served as patties, casserole dishes, meat loaf, or any other serving for which fresh ground meat is normally used.

Dehydrated meat is appetizing. Its flavorful dishes are not readily distinguished from those prepared with fresh ground meat. Nutritional protection of the product is afforded by measures which effect reabsorption of the mineral elements from the meat juices in the processing and minimum loss of vitamin potency through accurate control of low temperature operations. In addition, the high protein value of the product is no more affected than by normal cooking.

To meet special army and navy specifications for lard and shortening, new types of these foods have been developed. The meat packing industry is now making war style lards which not only maintain satisfactory consistency at high temperatures but which also possess greater resistance to rancidity than the usual commercial product. The navy has been furnished large quantities of a special shortening which has stability over a long period. Special shortenings have been developed for the army, such as those used in parachute rations.

The meat packing industry is a large producer of margarine. This portion of the business has been extended to 180% of normal production in order to meet increased requirements for high quality table spreads. Shortages of imported fats and oils and increased domestic production of soybean oil have necessitated new formulas for all types of blended and hydrogenated shortenings.

In all of these new developments the research chemists of the meat packing industry have played a leading rôle. Shortages of various supply items have compelled the development of new processes and new products that could be packaged in available supplies not previously used in this industry. Many of these research efforts had to be carried out with extreme rapidity. One outstanding example was the order prohibiting the use of tin for dog food containers. This necessitated a complete change in dog food manufacture for the meat packing industry which had previously produced several million pounds of this product per year. The dog food formulas which were used in the canned product were dehydrated to produce a product which would keep

in a cardboard container. The continued production of these dog foods was a valuable contribution to the war effort. If they had been removed from the market, much of the meat now available for human consumption would have been fed to household pets. The relationship of a man and his dog becomes even stronger in war time, so that the proper feeding of dogs becomes as much a problem as the proper feeding of the individual members of the family.

The meat industry was faced, with our entry into the war, with a tremendous problem of expansion of canning facilities. It has been estimated that the industry increased its canning capacity at least fourfold to meet Government and army requirements for canned meats. This expansion was accomplished mainly through operational revisions with the use of a minimum of new equipment.

The meat packing industry has been particularly prominent in the new field of dried egg production. The dried egg industry, which was formerly of small size, has expanded its capacity to some 300 million pounds per year. The major share of this new production is handled by the meat packing industry.

The record level of United States' meat production in the current crop year, estimated at 24 billion pounds of dressed weight, is a tribute to the far-sightedness of the Department of Agriculture and to the intensive efforts of American producers, who have done a magnificent job in the face of a growing shortage of labor and equipment. This Nation is particularly fortunate in being able to supply meat to our allies, give our own fighting forces the best diet in the history of warfare, and by good management assure every person on the home front the essential nutritive elements needed for strength, health, and victory.

SPEAKERS AT THE AFTERNOON SESSION
Robert J. Moore, David Klein, Bruce K. Brown, H. E. Robinson
By Courtesy of *Chemical Industries*

# Synthetic Resin Plastics

***By* Robert J. Moore, F.A.I.C.**

*Manager, Development Laboratories, Bakelite Corporation, Bloomfield, N. J.*

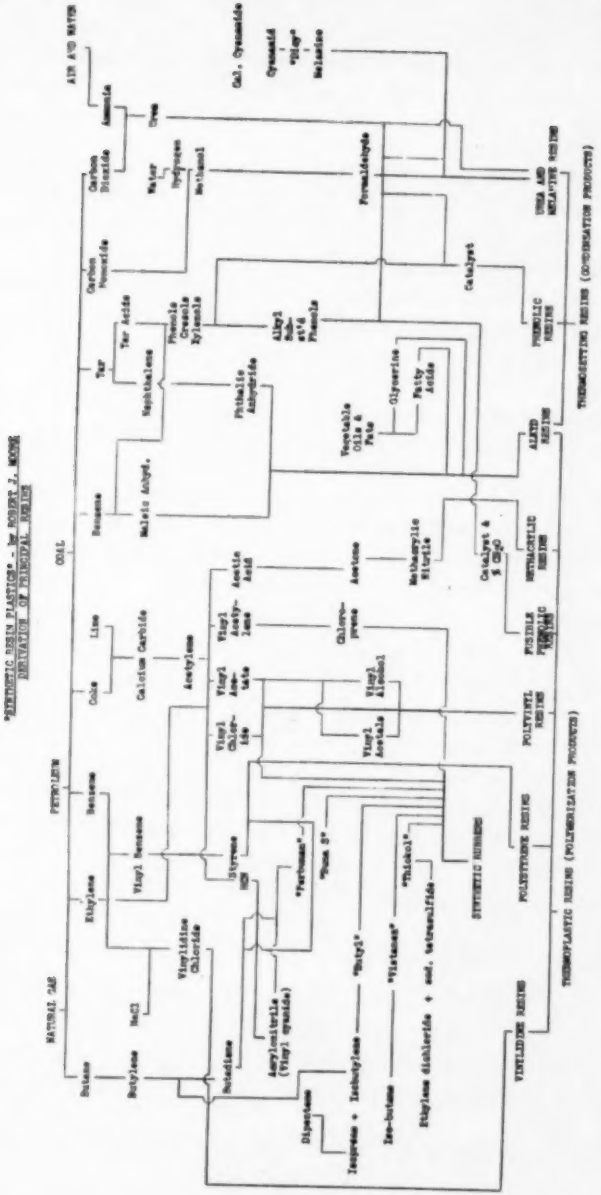
*An Industry Outgrows Its Name*

PLASTICS may be defined as those substances capable of being molded into a desired solid form. In this sense clay used for pottery back in the frontiers of civilization is probably the earliest example. Papier maché was also used as a plastic by the early Chinese. However, in recent years, starting with the control of the phenol-formaldehyde reaction by Dr. L. H. Baekeland in 1908, we have considered as synthetic resin plastics those that could be molded usually under heat and pressure. Such molded articles during the past thirty years have gained annually in diversification and general acceptance. They are made from plastic materials, molded to desired shape, and have been properly called "modern" plastics.

But today this industry embraces much more than mere molded materials. It has come to include all the many products based on synthetic resins. From these synthetic resins we produce laminating and impregnating materials, cements and adhesives, protective and decorative coatings, electrical insulating materials and cable compounds; coatings and modifiers for textiles, paper and leather. From synthetic resins we have built up modern plywood and impregnated wood, bonds for grinding wheels and brake linings; we have produced a new world of synthetic resin textiles and synthetic rubber. The industry has in reality outgrown the name of "Plastics." From the original molded automobile distributors or molded bottle caps, and the early cast phenolic pipe stems, we have travelled a long way. Today we serve industry in many ways, strategic in war as well as in civilian life. Perhaps, with all its ramifications, we should re-name the industry what it really is today, "The Synthetic Resin Industry."

*The Synthetic Resins and Their Sources*

There are many materials which, although plastic, we are not including within the confines of our title. We omit, for example, glass and ceramics, proteins such as casein and zein, and the lignins from wood.


"SYNTHETIC RESIN PLASTICS" - by ROBERT J. MOORE
DERIVATION OF PRINCIPAL RESINS
AIR AND WATER
COAL
PETROLEUM
NATURAL GAS
Ammonia
Urea
Cal. Cyanamide
Cyanamid "Dicy" Melamine
Carbon Dioxide
Water
Hydrogen
Methanol
Formaldehyde
Carbon Monoxide
Catalyst
UREA AND MELAMINE RESINS
Tar
Tar Acids
Phenols Cresols Xylenols
Alkyl Acid Phenols
PHENOLIC RESINS
Naphthalene
Phthalic Anhydride
Vegetable Oils & Fats
Glycerine
Fatty Acids
ALKYD RESINS
THERMOSETTING RESINS (CONDENSATION PRODUCTS)
Benzene
Maleic Anhyd.
Coke
Lime
Calcium Carbide
Acetylene
Acetic Acid
Vinyl Acetate
Vinyl Chloride
Vinyl Alcohol
Acetone
Chloroprene
Methacrylic Acid
Methacrylic Esters
Catalyst & H2O
METHACRYLIC RESINS
POLYVINYL RESINS
POLYSTYRENE RESINS
SYNTHETIC RUBBERS
Ethylene
Propylene
Butylene
Isobutylene
Butadiene
Styrene
Vinyl Benzene
Vinylidine Chloride
HCl
Acrylonitrile (Vinyl cyanide)
"Perbunan"
"Buna S"
"Thiokol"
"Vistanex"
"Butyl"
Ethylene dichloride + sod. tetrasulfide
Isoprene + Isobutylene
Iso-butene
Diperbene
VINYLIDENE RESINS
THERMOPLASTIC RESINS (POLYMERISATION PRODUCTS)

We are not attempting to include many other *natural* plastic materials such as rubber, shellac or the many bituminous tars, pitches, etc., used in so-called "cold molding." We are selecting for this discussion those synthetic resins which comprise the greatest volume of so-called "plastics" production, and we give special emphasis to those having engineering properties rather than merely decorative appearances. These principal types are outlined together with general derivations in the attached chart. They embrace the following: alkyds, methacrylics, phenolics, polystyrenes, polyvinyls, urea and melamine resins and vinylidine resin. All these, in general, stem from the basic raw material sources of coal, petroleum, natural gas, air and water. This derivation flow sheet is based on generally accepted procedures, but does not attempt to cover various additional or auxiliary derivatives. Included in the chart is the derivation of several of the synthetic rubbers. The American public has learned to recognize and watch with intense interest the race of many laboratory thoroughbreds with Buna S, apparently the favorite, heading a field including Thiokol, Resistoflex, Neoprene, Ameripol, Butyl, Koroseal, Chemigum, Vistanex and Pliofilm. Many of these have certain improved properties over natural rubber, especially in resistance to oils and solvents. Many have shown satisfactory wearing life in tires. These, and other varieties still in the laboratory, will undoubtedly influence industrial effort after the war.

*The Cellulose Plastics*

Omitted from the above chart, yet forming an integral part of today's plastics industry are those derived from cellulose. They are not included in essentially synthetic resinous materials and are therefore listed herewith, merely in passing.

Cellulose Nitrate is well known as one of the oldest of the plastics material. Its use plasticized with camphor to give "Celluloid" has become nationally known, although its flammability has retarded much of its use as an engineering material. The nitrate is the base of the modern nitrocellulose lacquer coating.

Cellulose acetate joined the field of molding materials about 1930

bringing to them added toughness, resilience and a bright transparency which offered a range of beautiful color effects. It marked the beginning of the increased use of thermoplastic or heat-softening materials using the high pressure injection press.

Cellulose Aceto-butyrate: The acetate is obtained from cotton linters by reacting with acetic acid and anhydride and hydrolyzing. When a mixture of acetic and butyric acids is used, the aceto-butyrate results. This has much better water resistance and somewhat better impact strength than the acetate.

Ethyl Cellulose: This is a much more recent addition to the family of cellulose plastics and is finding utility in the thermoplastic molding materials, especially because of its retention of toughness at low temperatures. It has excellent heat-stability but is attacked by all organic solvents except the straight chain petroleum hydrocarbons.

The principal synthetic resin base materials, which make up the great volume of the industry are those given in the attached chart. They are described briefly as follows:

*Phenolics*

The phenol-formaldehyde resins are generally looked upon as the founders of the modern synthetic plastics industry ever since their announcement by Dr. Leo H. Baekeland in 1908. Their variety is almost infinite and their properties cover a comprehensive range. The phenols may include phenol itself, cresols, xylenols, resorcinols, substituted phenols and so on. For formaldehyde may be used (with differing results) other aldehydes and ketones. Catalysts may change the entire nature of the reaction, while method and degree of polymerization, together with additive or limiting properties of modifying agents, increase the myriad possibilities. Added to these variables we have in molding materials the marked effect of filler and pigment. Thus we have for selection in phenolic molding materials alone properties which type them as: General Purpose, Heat-Resistant, High Impact, High Dielectric, Friction-Resistant, Arc-Resistant, Non-Bleeding, Moisture-Resistant, Closure Type, Extrusion Type, Acid and Alkali-Resistant, and several others.

The versatility of the phenolic base resin is illustrated in the many

samples here on display. These show their use, in addition to the molded articles in the following fields:

Laminated materials, adhesives and bonds such as in plywood, sandpaper, grinding wheels; cast resins, cements such as brush-setting and lamp-basing; impregnating and insulating materials for electric winding, impregnated wood, varnished cambric, calendered cloth, and a variety of resins used by the paint and varnish industry for protective coatings.

*Ureas*

The urea-formaldehyde condensation gives an intermediate water soluble stage which product is valuable in laminating; in treating paper and textiles; in cold-setting cements and for use in baking enamels (generally plasticized with alkyds). By further treatment, generally with alpha cellulose, a molding material is produced. These urea molding materials introduced about 1928 added whites, ivories, and tints to the line of thermo-setting plastics. Since 1939, melamine has been increasingly used with ureas to give harder, quicker setting with better water resistance and electrical properties. It has also been used to give quick-baking enamels such as for white refrigerator parts.

*Polystyrene*

Polystyrene was made commercially available as a thermoplastic molding material about 1937. In the past three years this light weight, water-white plastic has proven outstanding in its electrical resistance and chemical resistance properties. As an electrical insulator for example, one grade for high frequency circuit has a power factor of .0001 to .0002 at 1000 cycles, and less than .0002 at 1,000,000 cycles. At 60 or 50,000,000 cycles, the power factor, dielectric constant and loss factor for standard polystyrene film or molded parts remain the same—the lowest of any organic plastic. Added to these properties is its exceptional dimensional stability.

*Polyvinyl*

There are several varieties of vinyl resins, and many uses for each. Polyvinyl acetate, for instance, is widely used for adhesives; polyvinyl butyral is the widely adopted interlayer for high test safety glass; polyvinyl chloride is used for pipe wrappings, for pipes themselves instead of metal, for cloth coatings. The copolymer, however, of vinyl chloride

and vinyl acetate is the most versatile of this group. This copolymer yields a colorless, transparent, thermoplastic molding material, of good tensile strength and high water resistance. Its odorless and tasteless properties, combined with resistance to moisture, chemicals, oils and greases have made it valuable for dentures, beer-can coatings, and as liners for bottle caps for foods and pharmaceuticals. Its transparent sheets are used for airplane window frost shields, radio dials, etc. Of extreme interest in defense work has been the insulation of wires and cables. Besides high electrical insulation values, and their resistance to fire, water, acids and oil, they have long life characteristics since they do not oxidize under the influences of sunlight and air.

Another vinyl derivative which was introduced in 1940 has shown recent utility. This is the vinylidine chloride type of polymers and copolymers, derived from ethylene. These thermoplastics show high toughness and resistance properties in molded and extruded forms, the latter, for example, as tubing.

*Methacrylate*

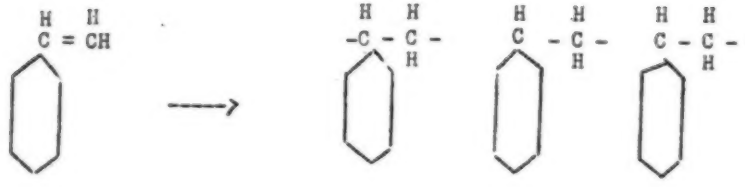
Since 1940 the acrylate resins derived as shown on the chart by way of acetone or from propylene from petroleum have offered another attractive thermoplastic. These methyl methacrylate resins are colorless and transparent and are used in coating, extrusion molding, and as finishes and stiffeners for fabrics and leather. They have proven their efficiency in the making of dentures.

Their military use in aviation has been largely in their cast sheets replacing glass in gun turrets, cockpit enclosures, etc. Civilian uses include display fixtures, ornaments, lighting equipment and furniture parts.

*Alkyds*

These resins, based on polyhydric alcohols and polybasic acids have been widely used during the past decade in protective coatings, both air-dried and baking types. They do not lend themselves to modern molding conditions, but are increasingly used to modify other resins used in laminating varnishes, wire enamels, adhesives, etc. They are related to a wide group of polyester resins for cast materials and numerous other industrial uses.

## 1 STYRENE TO POLYSTYRENE (THERMOPLASTIC)

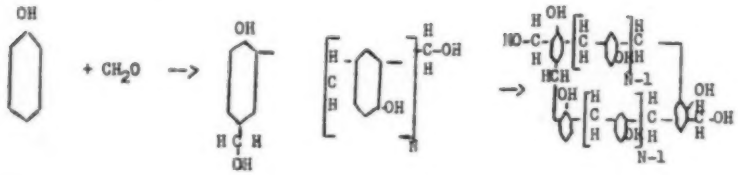


Vinyl benzene

(Styrene)

Polystyrene

## 2. PHENOL ALDEHYDE (THERMOSETTING)



Phenol Formaldehyde Fusible, chain poly-phenol alcohol An infusible, cross-linked polymer.

## *THERMOPLASTIC AND THERMOSETTING*

Synthetic resins and their plastics fall into two general subdivisions based upon how they are affected by heating. The chart of derivatives referred to earlier shows the resins divided into polymerization products at the left which are thermoplastic; and condensation products at the right which are thermosetting. Among the latter are the phenolics, the ureas and melamines and some of the alkyds. The others are thermoplastic. Thermoplastics being long-chain linear polymers with little cross-linking, soften up and melt when heated. They remain liquid when heated over long periods. Thermosetting resins, on the other hand, consist of condensation polymers with considerable tri-dimensional configuration. Typical examples of each are shown in the following types of polymerization on heating: (See opposite page).

These reactions are influenced by catalysts and, in the case of the second type, by proportions of the reactants. Thus by use of certain catalysts, we may prepare phenol-formaldehyde resins which are fusible and remain thermoplastic (Novolaks) as shown on the chart.

The thermo-setting phenol-formaldehyde resin is still by far the most widely used of the synthetic resin plastics. The initial reaction of its two constituents gives off water and yields a liquid product "Stage A." On further heating this liquid thickens, and we may stop at an intermediate stage of polymerization ("Stage B") which is still soluble in alcohol and which may be used as the basis of molding powders, laminating varnishes, adhesives, etc. Now on further heating we polymerize to the completely tri-dimensional ("Stage C") which is the infusible and insoluble base of its many applied uses.

### *The Diversified Uses of Synthetic Resins*

In writing the title of this paragraph, one is struck with the obvious impossibility of attempting even a mere outline of their widespread utilization. It is necessary to eliminate by mere mention entire industries. For example, man-made fibers constitute one such field. Synthetic fibers have their industrial uses such as chemically-resistant filter-cloth and inert insulation. But to the public these test tube fibers have been roundly endorsed over the products of bush and worm. Names

such as Nylon, Vinyon, acetate rayons, viscose rayons, are in daily use. There are also wool-like fibers from milk and casein, and from many synthetic resins. Glass is spun through fine orifices to make an extremely fine filament which is woven into silk-like, non-inflammable textiles. This filament fineness may be visualized by the statement that a small ball of glass the size of a marble is drawn into a filament ninety miles long—a fine, silky strand reaching from New York City to Philadelphia!

We have selected the following industrial uses as illustrating the impact of synthetic resins on the war effort and in supplying our strategic industries.

1. *Molding Materials*

The largest engineering use of the plastics under consideration is in the field of molded articles. Illustrated here on the tables are dozens of such products such as telephone handsets, radio cases, radio and light tube bases, and many examples of the use of such materials in defense work. Here are housings for airplane instruments, sealed resistors, radio coil housings, throat microphones for aviators, booster tubes and detonation caps for bombs, and fuse well caps.

The molding operation itself is one that has undergone vast improvement in equipment and processes. We have high speed injection machines for molding thermoplastics and automatic compression machines for molding thermosetting materials. In the early days (not many years ago) it took fifteen, twenty and even thirty minutes to produce a molded part from a thermosetting phenolic material. Today the time has been cut to from fifteen seconds to five minutes, depending upon the size and design of the piece and the type of compound used. Thermoplastic parts can be produced even faster. Thus, one of the contributions of plastics to Defense is in the speed and great saving of man-hours possible through molded and laminated parts. Since we can now mold plastics into almost any shape, fabrication is simplified by the elimination of rivets, screws, bolts, etc., which take valuable time in manufacturing. In addition the part comes out completely finished, eliminating the necessity of protective coatings.

Fully automatic presses with high speed production are now available for molding both thermoplastics and thermosetting materials. Perhaps

the most recent development in molding operations is "Heatronic Molding" as announced in March, 1943 by V. E. Meharg (*Modern Plastics* magazine, March 1943). This method employs as its heating energy high frequency current in an electrostatic field. By this method curing time may be shortened to one-tenth to one-half the present intervals and much thicker and heavier pieces may be fabricated.

By the use of special fillers and control, phenolic molding materials of the so-called shock-resistant type are produced. These are specified by both the Army and Navy for a great variety of parts which in everyday commercial practice could be satisfactorily molded of "general purpose" compounds, but the shock-resistant materials must be used because of the great stresses suddenly applied by the detonation of heavy guns and high explosive charges in the vicinity of combat equipment. Shock-resistance is of prime importance in instrument cases for aircraft and marine use, terminal blocks for important electrical connections, junction boxes for submarines, and circuit breaker boxes for all types of craft. The Army also includes similar requirement in aircraft instrument cases and control devices, fuse timers for shells, electrical fittings for tanks, trucks, etc.

An example of use of shock-proof molding material to speed up production, together with a gain in use-values is shown in the replacement of selected walnut for Smith & Wesson's sub-machine gun stocks. At no increase in cost, the manufacturer gained a superior product from the standpoint of production, assembly and use. The stocks were transfer-molded, completely formed in a single operation. Polishing and other finishing steps were eliminated. Dimensional stability, light weight and resistance to extremes of climatic conditions were obtained at the same time.

2. *Laminated Products*

It is quite common for engineers in the aircraft or electrical industries to divide plastics into two broad fields, namely, molding materials and laminated materials. While it is true that these two make up the bulk of the engineering products, they nevertheless leave out a variety of other resin uses mentioned below.

The principal laminating material today is the phenol-formaldehyde type, which is made available in sheets, rods and tubes.

Laminated material is made by treating fibrous sheets, such as paper,

woven cloth, etc., with synthetic, heat-reactive resins, and subjecting built-up layers to heat and pressure, resulting in a hard, tough, homogeneous material.

In manufacture, the paper or fabric base is first impregnated with the resin in solution while the resin is still in a partially polymerized state. This stock is dried and is ready for the further heat and pressure fabrication in which the resin is completely polymerized to the insoluble, infusible stage. Layers of the sheet stock may be piled, in the case of sheets, or wrapped for tubes and rods. For standard grades of laminating normal pressures of 2,000 to 3,500 lbs. per sq. in. are used. Recently, however, we have announced special quick-convertible laminating varnishes for cloth and paper which mold at low pressures of 200 lbs. down to zero pressure and which still yield tensile strengths of over 35,000 p.s.i. There are a variety of properties depending on whether the base material is paper, fabric, asbestos or other material. By using a cloth of glass fiber there results remarkable, heat-resisting and insulating qualities. Applications for this type vary from use as insulating material in mining motors where high temperatures are encountered, to use as insulators in radio broadcasting equipment.

The resistance and strength properties of phenolic laminated materials are responsible for the ever-increasing use of these materials in electrical insulation, and in aircraft and automotive industries. Their toughness and wear resistance is demonstrated in the automotive timing gears. The radio and telephone depend upon them for insulation. Of special interest is the wide variety of aircraft parts now made of this material. They are illustrated here in such diverse fields as laminated table tops and the Army helmet liner. In mechanical uses laminated phenolic is stronger than cast iron and has ninety per cent of the tensile strength of aluminum although only one-half the specific gravity. These properties together with its high resistance to moisture and oils at once insure its position in strategic industries. In recent years for panelling purposes, urea-formaldehyde or urea-melamine top sheet have been used to give whites and pale tints.

3. *Cast Resins*

By condensation and polymerization of phenol formaldehyde, a type of heat-reactive, fusible, soluble products are obtained. These poured into lead molds for further polymerization or "curing" by heat make up

a considerable industry in so-called "cast materials." These bright colored resins are widely used in the novelties, displays, radio cabinets, brush backs, gear shift knobs, etc. Most of these uses are so-called non-engineering types although several applications have been made during the past year in defense work. One interesting use for the cast resins is made by the research engineering divisions of certain defense units in the photoelastic stress studies of structural materials. These resin models of steel structures show, by passing a beam of monochromatic polarized light and viewing or photographing through an analyzer, the play of strains in the section when stress is applied. Thus possible strains in steel or other metal structures are determined in advance so that design may be altered if necessary. These phenolics and other types of cast resins are now being used in jigs and forming dies for fabricating sheet metal in the aircraft industry.

4. *Bonding and Adhesives*

Synthetic resins are the strategic bonds for modern high-speed grinding and snagging wheels, and of water-resistant sandpaper. They are the basis of today's water and oil-resistant brake linings and clutch facings. Here they play their part in all automotive and aircraft equipment, and in the rigorous service of petroleum drills. Synthetic resins furnish the bond for today's great development in synthetic-resin plywood. Here they form the basis of the so-called plywood plane and the glider—streamlined to give speed in production as well as greatest speed in the air. Such resin-bonded plywood is the structural material of the PT torpedo boats and the great cargo planes now being built. In making plywood thin veneers of wood are placed together alternating the grain of each ply at right angles to the adjoining ply.

The synthetic resin glue, because of its strength and because it is not affected by moisture, high humidity or fungus growth, has in the past few years rapidly displaced animal and vegetable glues. Huge sheets are now fabricated and actually molded to curved surfaces, so that one section eighty-four feet long may be used for the side of a torpedo boat. When the plies of wood are all glued in the same grain direction, we produce the extremely strong "laminated wood." The next step in wood utilization has been to impregnate the laminated wood with the phenolic resin in the B-stage, then "set" it under heat and pressure. This gives

the new development called Compreg, which is the material of greatest weight-strength ratio, stronger than alloy steels.

In other adhesives and bonds, synthetic resins are establishing new standards of bonding strength. They furnish the impact-resistant bonds for steel-to-steel, bonds for paper, glass, wood, textiles—bonds that are colorless, odorless, tasteless and non-toxic. Transparent and tough sheet resins furnish the bonding layers for our modern shatterproof safety glass. Other transparent, colorless resins are sheeted or cast and fabricated into the nose and enclosures of many of our military planes.

The plastics industry also includes such a wide range of developments as cements for brush setting and for electric-lamp basing; insulation as wire enamels, varnished cambric, motor and generator windings, Navy cable and industrial tapes. Entire airplanes and tanks are wound with such adhesive tapes to protect them from salt air and water in their trips across the ocean.

5. *Plastic Printing Plates*

A recent development, strategic today because it releases metal alloys, but which bids fair to influence the future is the synthetic resin printing plate and matrix, replacing metal electrotypes and stereotypes. These new plates have fidelity of reproduction up to 175-line screen and weigh only one-eighth as much as the conventional metal plate of the same area. This leads to economy in handling, shipping and storing, with long storage of such quality bookplate showing no corrosion. The weight factor is important in large advertising campaigns or in the distribution of finished plate news to foreign countries.

6. *Synthetic Resins in Protective Coatings* (Paints, varnishes, primers, lacquers, baking resin solutions, etc.)

No account of the place of plastics in defense would seem adequate without some reference to the importance of synthetic resin coatings for protection. In anti-corrosive paint systems for steel, aluminum and magnesium alloys, these resins are outstanding. A glance at the specifications of the Army, Navy, Bureau of Aeronautics, U. S. Engineers, Quartermaster Corps, Ordnance Department and similar engineering groups will show the large extent to which all important coatings are based on synthetic resins. The principal resins in such coatings are the

phenolics and the alkyds. Some of the more important coating systems are illustrated in panels here shown. For example, the specification anti-corrosive primer for protection of aluminum and magnesium alloys is based on a new type resin combination which air-dries after spraying in less than five minutes, and which protects the metal from corrosion in salt air. It is standard for practically all aircraft. Upon these synthetic resins are based the new protective coatings for plywood aircraft. Baking coatings which polymerize the resin "in situ" are being applied to protect iron and steel in tanks, tank cars, drums and parts of ships.

Most recent of these surprising resin developments in coatings are water emulsion paints, which on drying a few hours become highly resistant to water or scrubbing and highly durable. Thus we may use water in place of volatile and combustible solvents, with a great gain against storage, shipping and painting hazards. This is extremely important in the future of coatings aboard ships. Similar water emulsion paints are used as the priming coat on textiles, since they do not penetrate to the underside but do offer a smooth surface to hold out the top coats. One of today's uses is in the first coat for military raincoats.

But the revolutionary effect of synthetic resins on the vast paint and varnish industry is a story in itself—and can be but mentioned in passing.

## *"NEW FRONTIERS," AND THE POST-WAR PERIOD*

When we consider the diversity of the synthetic resin industry alone, and also the opportunities in the other changing industries which make up this chemical era, is it any wonder that we are impressed with the unbounded frontiers of modern science? Just as the mechanical era of the last century was eclipsed by the electrical era, this in turn is being overshadowed by the chemical era—the Age of Synthetics. Foods and vitamins, pharmaceuticals and drugs, liquid fuels and plastics, synthetic textiles and dyes, light alloys and heavy chemicals, are but a few examples where the scientific activity of today is leavening the industrial world of the post-war era.

We occasionally have heard our younger generation bemoan a lack of opportunities—no new frontiers to conquer—no lands undeveloped! Let these young people explore the frontiers of experimental science. We

have merely blazed a few trails. We stand on the threshold of developments which promise new industrial worlds. The re-modeling of American industry is fast proceeding, catalyzed in the test tubes and beakers of our chemists.

In but two of the industries described today, petroleum and plastics, we are witnessing changes that will bring new energy and life to manufacture, and will profoundly influence modern living. Multiply these by the new developments in other chemical industries, and by the basic improvements in such fields as electronics and air transportation, to visualize a post-war period which will sweep away the fears of unemployment and depression.

In closing, since we have dwelt so much on plastics and considering the world-wide conditions of today, could we not end on this note of "Old Omar:"

> "Ah, friends, could you and I with fate conspire
> To change this sorry state of things entire;
> Would not we shatter it to bits, and then—
> Remold it—closer to the heart's desire."

Left to right, Dr. Donald Price and Dr. V. N. Ipatieff

# Landis and His Achievements

**By H. L. Derby**

*President, American Cyanamid and Chemical Company*

I HAVE been asked to outline Dr. Landis' achievements. They are varied and far-reaching, but insofar is they relate to his accomplishments with American Cyanamid Company I have gone to the record.

In the winter of 1909-10 Dr. Landis, who was then assistant professor of metallurgy at Lehigh University, was invited as a consultant to work out a problem for the supply of gas for retorts furnishing nitrogen used in the cyanamid process at the new plant of American Cyanamid Company at Niagara Falls, Ontario. After the successful solution of this problem, Dr. Landis was called in once or twice more, still as a consultant, to work out technical problems in the production of cyanamid. The problems connected with the cyanamid process at this time were purely of a pioneer character, for the cyanamid process of nitrogen fixation had only begun to reach a commercial scale in two or three plants in Europe and had to be adapted to the conditions of equipment, climate, power, markets, etc., encountered in this country.

In 1912 he severed his relations with Lehigh and joined American Cyanamid Company as director of research, continuing in that capacity until 1923. During the next several years, as a result of intensive research and development, great improvements were made in the equipment for the recovery of nitrogen gas, in the amount of nitrogen fixed in the cyanamid, in power consumption, and in many other ways. During this period he found opportunity to study at first hand the developments abroad in the process, using his knowledge to better some of the methods used at the Niagara Falls plant.

After the outbreak of war in Europe, new problems arose resulting from the demand for new products and from the cutting off of foreign supplies. One of the first of these came in 1915 from a large American company producing war materials for the British. The need in this case was for the gas, argon, used in incandescent lamps. Although experiments had been made on processes for the production of argon both here and abroad, there was no commercial process in operation

unless the Germans had perfected one after military censorship had been clamped on information. The Company undertook to supply what were then deemed to be large quantities of argon to the American firm, and Dr. Landis went to work in perfecting a commercial process using the gases generated in the fixation of nitrogen.

A number of years before it had been found through the experiments of European scientists that cyanamid, when treated with steam, would evolve all of its nitrogen in the form of ammonia. Acting on this principle, Dr. Landis undertook development work on a pilot plant scale at Niagara Falls in 1914, which eventually led to a number of engineering improvements in the type and use of equipment suitable for putting the process on a commercial basis. As a result of his experiments, a commercial plant for the recovery of ammonia from cyanamid was built, in the development of which still further improvements were made. The engineering and construction problems involved in this operation of obtaining large quantities of ammonia from a large tonnage of cyanamid when treated with steam under pressure were new to this country at the time and led to other novel developments. As a result of his work, many thousands of tons of ammonia have been produced at this plant and have been sold in different forms under competitive conditions throughout the world.

Both the capacity and the market were being expanded for cyanamid as a source of nitrogen and as a fertilizer conditioner. Dr. Landis had been conducting a number of experiments for a suitable commercial process for the production of phosphoric acid. With the development of the ammonia-from-cyanamid process which appeared to be more economical than the other ammonia processes known at that time, attention was turned towards developing a market for this ammonia as a supplement to the essentially limited production from by-product coke ovens. If a way could be found to combine this ammonia with phosphate in a readily available form, a high grade fertilizer could be produced having two of the three principal plant food elements for which a substantial market could be developed. As a result of experimental work, Dr. Landis adopted a wet process of making phosphoric acid, with which he combined cyanamid-ammonia. The resulting product has since become well-known throughout the fertilizer world as Ammo-Phos and has been sold in hundreds of thousands of tons in this country and abroad.

Along with the development of the extraction of ammonia from cyanamid, Dr. Landis began experiments for the oxidation of ammonia to nitric acid. At this time (1914) the commercial exploitation of such a process was unknown in this country, and, in fact, there was only one small plant in operation in Europe, though experiments had been conducted on the subject for many years. All nitric acid then being produced in this country was converted from Chilean nitrate. Demand for acid rapidly increased for the manufacture of powder for the British, and fears were arising of German interference with supplies from Chile. During his experiments he had found that the ordinary platinum gauze was not a satisfactory oxidizing agent, and this, of necessity, led him into the metallurgy of platinum metals and even the mechanics of drawing and weaving. From these studies he worked out a platinum gauze which proved successful in commercial operation. Nitric acid-resisting alloys were then unknown, and there was neither time nor money to build granite towers. Accordingly, in this experimental unit he used ordinary steel for his absorption tower, figuring that he could obtain his results and prove his process before the towers disintegrated. The entire operation proved to be successful, and a commercial plant was later built after our entry into the war and used for supplying large quantities of nitrates. The process was installed on a far larger scale in the Government Nitrate Plant No. 2 at Muscle Shoals, and although that plant was never in full operation due to the ending of the war, it went through successful tests. Here again he was a pioneer in the art of converting ammonia to nitric acid. At the present time there are dozens of plants in this country burning ammonia on platinum gauze as he first carried it out in his experiments at Niagara Falls back in 1915.

Dr. Landis was an important instrument in breaking the German hold on the world cyanide market during the last war. The process developed by Dr. Landis was so successful that in later years it was put into operation in Germany itself, and today is an important process in the world for the production of cyanide.

His work on cyanamid and cyanide derivates has formed the basis for the development of many other industrial products. During the last war he worked out a commercial process for producing urea from dicyandiamid, a process which had not gone beyond the laboratory stage in Europe. Considerable quantities of urea were made to over-

come the shortages required in the manufacture of munitions and celluloid. He improved the processes for the manufacturing of anhydrous hydrocyanic acid and adapted the use of cyanide derived from cyanamid for this purpose. After the war, still as director of research, he was instrumental in perfecting the process for producing sodium and potassium ferrocyanides which had heretofore been imported exclusively from Europe.

From the records and incidents that I have narrated, it should be clear that Dr. Landis' achievements have not been in the field of fundamental research, and he would be the last to claim credit for discoveries in that branch of the science. His accomplishments, rather, have been in the development of processes, the adaptation of equipment, and the commercial application of chemical products.

There are many other achievements which could be fairly credited to Dr. Landis, but they are of such a nature that their divulgence now would be improper and against national interest. I would be failing in my responsibility on this program tonight if I closed my remarks without referring to Dr. Landis in a more personal and intimate relationship as his colleague and friend. Over the past fourteen years it has been my privilege to know the Doctor, and in working with him form an affection which is based on human relations which, to put it mildly, have been most pleasant. I have never heard anyone say he did not like Dr. Landis. His congenial personality and ever willingness to coöperate with his fellow workers begets affection to the individual, and his associates are his friends.

Dr. Landis in his professional association with Lehigh and now as Trustee of that great university has always had the greatest interest in young men, particularly those of his chosen profession. During the depression years he devoted his energies and a great amount of time and money in endeavoring to find situations for unemployed chemists. He persuaded many concerns in our industry that in time of depression was the time, through research and development, to create new opportunities in the chemical field.

Naturally we of the Cyanamid organization are highly pleased and proud of the selection of Dr. Landis for this high honor that you bestow upon him this evening. With the termination of the war the further chapters of the record will serve to confirm the judgment of your INSTITUTE in awarding this medal to Dr. Walter S. Landis.

# The Personal Service of the Chemist to the Nation

*By* **W. S. Landis, F.A.I.C.**

I WAS informed that I would have to earn my dinner by making an address. That is very difficult, for after listening to Brothers Grimm Toch and Baron Munchausen Derby my task is very difficult. I shall not speak to you on technology, or on some involved scientific subject, for this is a professional society and it seems more appropriate to me to talk about the present outlook for the chemical profession rather than on some passing chemical achievement.

I have not brought my hat along and, therefore, will not pull any rabbits from it. In the first place I never found that legerdemain was a very effective means of solving the many problems that pass over my desk. Possibly that old two dollar and forty-nine cent hat of mine just was not the right kind. Perhaps I might have had more success with a Stetson, but I doubt if even such would produce a new reaction, or a new product, or a new industry. True I have never tried some of those Easter confections such as I passed in the Lobby on my way here. Maybe some such ingenious construction would have been more effective, but I do not know really—I just never tried to operate on one of them.

Most of my friends know that I am not at all in sympathy with the idea of letting the Witches of Macbeth operate my plants. I think it is much more honorable to be recognized as a chemist, even a poor one, than to be labelled a magician. This magic and sleight-of-hand chemistry has done a lot of harm to the profession, much more than is really appraised, and it is going to take a long time to live down and dissipate it. I am quite happy to be recognized as a member of the honored and ancient calling, one which has contributed so much to the betterment of this country in which we find ourselves.

Now in proceeding let us for a moment exercise our imagination. Consider ourselves as of a generation ago. Further let us select two youngsters, as near alike as young people can be. One we shall leave right here in the U. S. A.—the other we shall transplant to a distant

land, for example down into a part of Africa, as yet practically untouched by the white man. For the lad here in America we send him through the public schools, the preparatory school, the college and university—finally to his degrees of Chemist and Doctor. The other we turn over to the African natives to rear. From which would you expect the greatest contribution and service to his fellow men in after life?

You say that is a foolish situation—in fact a most absurd one. But let us examine into the details more closely before drawing any conclusion. In the first place this African country is relatively high in elevation, it is reasonably healthy or could readily be made so, for whites have settlements not too far from the chosen native reservation. Rainfall is fair, the soil is productive, there are in the district vast stores of natural resources of the most varied character. Sparse settlements of natives have lived there for thousands of years, and judging by archeological remains, were at one time a clever people.

They possess freedom of movement, yet are segregated from the whites, who are not permitted in the reservations. A native constabulary under enlightened government supervision exerts a mild police control, dealing only with the more serious capital crimes. The chief of the local tribe is supreme, and concerns himself largely with collecting a goodly share of the equivalent of taxes. Private property is unknown, save for a sleeping mat of grass, a few tin cans, gourds or crude pottery. Religion is free, speech is free, the press would be free if there were one that could be operated without labor.

For long years a communal system has grown up among these native tribes. The land is community owned. The individual male may possess one or more wives or head of cattle—as a practicable matter these are interchangeable. The wife or wives cultivate a little patch of allotted land, which yields a part of the meagre supply of food—supplemented by such game as the native dogs may drive within assagai reach of the male. The native is very poorly fed because there is no incentive to produce more than the barest of subsistence. The people wander about, and a stranger dropping into the native village is entitled to food and lodging if any is available. Such is the communal system.

And again you say my set-up is grossly unfair with respect to our two subjects, for one has the benefit of our American schools, the other

no chance whatever of an organized education. Again let us examine more closely. Only a short time ago an honored member of our Senate in Washington and representing a great State that owes much of its prosperity to several branches of the chemical industry, introduced a Bill for consideration, in which are introductory words to the effect that our technical and scientific people suffer from "unplanned and improvident training". In due regard to his associates he probably chose his words most carefully. Therefore, we must be certain that our young lad in Africa be not handicapped by a misguided education, as is the fate of his compatriot here in the U. S. A.

You know this is a most serious charge made by a United States Senator against the educational system of our country. Twenty million young Americans are legally forced to subject themselves to such a condition this year. The taxpayers must find two and a half billion dollars for its annual support. Now this public school system is a hundred years old and see what it has come to! The teachers in most of these schools have had higher training, are carefully selected. The supervisors have been most rigorously picked, yet the best this system can do is furnish "unplanned and improvident training".

And then there are the preparatory schools. Usually these are operated privately, and are highly competitive, not only among themselves, but also with our Public High Schools. In industry competition has caused America to outstrip the whole world, and surely it can be expected to operate in the same manner in competitive school systems. But apparently here it has failed miserably.

Then follow the institutions of higher education, catering to a million and a half students and costing half a billion dollars annually. These fall into two categories, those State or publicly operated, and those privately endowed. Here also competition has full sway. Harvard is three hundred years old. Hundreds of these colleges and universities have been founded since then, each drawing on the experience of the older; in fact on the sum total of world educational methods. Yet we are seriously told by the distinguished Senator that the result is only "unplanned and improvident training". Therefore, I refute the challenge that my African lad is unfairly located. Could it be that the Senator may be grossly misinformed as to our education?

Well we shall leave the two boys to their respective environments. Our African lad is in the midst of a people who have lived in this district for thousands of years, a very old people. Here in America is a young population that has long been improvidently educated.

We shall not give the youngster in Africa a library for our Senator tells us that we are suffering from a serious handicap in the "unassembled and uncoördinated state of information concerning existing scientific and technical resources". It would seem that our Engineering Index, our Chemical Abstracts, our trade and scientific journals, the many bibliographies put out by the Government Departments, and our State institutions, the great library indexes, etc., are quite useless. This all would require vast housing, shelf room in untold lengths,—all wasted effort. Somewhere we have slipped in our system of classification, indexing, tabulating. Think of the vast number of years that have all been misdirected, the tons of paper and ink destroyed, the Congressional Library and the thousands of lesser ones, the vast Government buildings that house such data accumulated over the centuries, all of less than no value. Certainly we must not burden our African resident with such uncoördinated material.

I am certain that by this time you will agree that in the light of the extensive information placed before our Senate, I have really given enormous advantage to the boy in Africa, for I have most carefully insulated him from the atrocious development of our educational system, have shielded him from the confusion of information on scientific and technical matters. He is not troubled in the least by monopolized control of scientific and technical data, for his location has been carefully chosen where such could never penetrate his communal environment.

Therefore, we may expect that in this selected and perfect environment revolutionary progress will be made in science and technology. The African bush, under his carefully nurtured and guarded development, will become a thriving industrial center, his tribal associates will attain a standard of living far beyond anyone's dream, a super Utopia. And as for our American reared scientist, he will find himself surrounded by desolation, decay, and only himself prepared for confused non-productivity.

Well you are one hundred per cent wrong. Our African will not produce a thing. The rich natural resources surrounding him will lie

untouched. He will sink to the level of the natives about him. He will produce no more than his neighboring black, for there will have been no incentive in this socialized system to call for an ounce more than the barest necessity of life. Any surplus would be taken by the chief or a fellow-tribesman, not necessarily by force, simply a tribal custom.

And our fellow chemist here in America with its system of reward—well, he will be just one of us, each year contributing his measure of advancement as long as incentive persists.

But there is even more to this story. Under the social system that has prevailed in the tribal system for untold years, our native has greatly deteriorated. He produces little more than enough to keep body and soul together, in fact is quite ill-nourished from his unbalanced diet. His house is the crudest assemblage of sticks, thatched with leaves, his possessions possibly a wife or two, maybe a few head of cattle, a grass sleeping mat, and the simplest of crude utensils for carrying water or for the simplest cooking. He wears practically no clothes, a crude piece of dressed hide at the most. Yet he actually possesses latent intelligence and skill, neither of which have shown themselves in his tribal life. In the arts he was a born metallurgist fashioning some rather clever weapons for he knew how to smelt iron and shape it. In the copper districts he also collected some of the native copper that is abundant in the country, from which he made ornaments and a few utensils. He possessed many of the freedoms that we talk so much about without understanding their true import. But, all in all, the socialism that permeated his entire life destroyed his every initiative.

Not so many years ago, less than a generation, the whites penetrated into his country, although rigidly excluded from his particular territory. The abundant natural resources gave opportunity for development. The rich agricultural lands were brought under cultivation insuring ample, even surplus food supplies. The ores abundantly strewn in the neighborhood furnished the basis for a metallurgical industry, and only a few miles, relatively speaking, from our native district arose great smoking chimneys and a vast manufacturing activity. The native wandered into these settlements of the white and was hired to perform the manual labor. Almost over night he was transformed

into a carpenter, a cabinet maker, a mechanic, a furnace attendant. With relatively small amount of white supervision all these latent talents were developed until he furnishes almost the entire labor of these great institutions,—feeding the furnaces, operating the coarser machine tools and running cranes and locomotives, in fact all types of service.

The white management set him up in a village with permanent housing, with community bathing and washing facilities, medical inspection, hospitalization. They gave him a better house of permanent construction than he had ever seen before, first of one room to which he had always been used, and as he matured in their service, two rooms, even three rooms. Schools were provided for his children, manual training for the boys, domestic economy for the girls. It was unsafe to leave a blue print lying around one of these institutions for it was certain to disappear, the manager of the natives would have to go out to the native quarters where he was sure to find it in the midst of a circle of eager blacks studying its details.

From these factory villages the old socialistic customs of the tribe were banished once and for all. It is true that the houses belonged to the company, but at least temporary possession was granted to each employee as long as he was in service. Land was set aside on which his family could produce vegetables and food for his consumption over and above that furnished by the commissary. Now that he could own private property, sewing machines began to appear in many of the households. He and his family adapted European clothing and struggled to acquire a wardrobe. The small phonograph arrived in numbers, then bicycles, this latter until they were somewhat troublesome on the highways, built for whites and their automobiles. While the old custom of buying a wife persisted, the price of one trained in the native schools rose to 200 or 300 per cent over the untrained daughter. These may seem interesting but unnecessary details, but I want to emphasize particularly that that social condition which destroyed any possibility of productivity of our white lad we settled among the native tribe and, which ultimately carried him down to the low level of his tribal fellowmen, was the result of a political situation and was not inherent in the character of the native. The native once removed from these socialized conditions immediately changed his whole character. I do not mean to infer that race barriers

were obliterated in any way, but I do want to point out how quickly he adapted the customs and clothing of the whites, the comforts and conveniences, true in a small way, that came into this country with the industrial development fostered by the Europeans. All the latent possibilities of the native came to the front, and he emulated the whites in thrift, in the desire to possess the comforts and conveniences of the modern world, and he worked hard to increase his estate.

Now this is not an exaggeration in any sense of the word. I can recite our own example in taking down to a less favored part of Africa an electric furnace plant for the conversion of cyanamid into cyanide. We sent down there as manager one of our employees who had no experience whatever in this field of electrochemistry other than a month's visit at our plant. We sent with him three of our foremen. We picked up locally two additional whites, an electrician and a master mechanic, and built this plant on the outskirts of a small village in the Transvaal. All the labor was performed by local natives who had never seen nor heard of an electric furnace. Within two months of the time it was started up we were operating at high efficiency and our foremen left for home, turning the work over to three local whites recruited in the district and some sixty natives. This shows the latent possibilities of a race that left to themselves under their own socialized system would never have done anything constructive. Once removed and set up where they could be taught, and where their earning capacity reverted to their own benefit, their performance matched all that could be desired.

We preach loudly of certain freedoms, but actually there are more phases than one commonly finds in the substance of even the most fluid orator. Our native possessed most of the freedoms, lacking principally only that of the acquisition of private property. It happens to be that this is the one freedom that furnishes the greatest incentive to production. Without it the other freedoms play a relatively lesser part.

I wonder how many of you ever thought of the origin of what we understood as freedom in our country—that is up until a few years ago. If you think that freedom is the cause of industrial development you are totally in error. It is industry that brought about the idea of freedom and it is industry that forced its development. Within every person there is the idea, very latent in many cases, of bettering his position in

the world. He is desirous of acquiring the maximum share of comforts and conveniences and is willing to work and save to earn them. No one is interested in harvesting a crop larger than he can consume if all the surplus is taken away for distribution to his neighbor. No one is interested in exercising his skill in production if the tax gatherer takes all his surplus production. No one is interested in developing a foreign market if unbearable restrictions are placed upon export, upon his obtaining remuneration for the goods shipped out of the country.

Thus pressure comes from the industrious and the thrifty to eliminate these heavy burdens that take too much of the surplus, that hinder the accumulation of an estate, that restricts the circumference of business activity. It has always been the thrifty and the industrious that have forced these great reformations of the social system. It is the developing of industry that forces and brings about full freedom. Once these handicaps are eliminated or reduced at least to a bearable degree, then human progress accelerates, and in measure exactly as the dissipation of the burdens. It is the free countries, free in the sense I have just defined the word, that have the highest standard of living, the most widespread distribution of comforts and conveniences. It is free America that has thirty million automobiles, not the total of absolute governments of the world, in spite of the fact that we have only one-fifth of the population.

With these truths and with these examples before us it is so incomprehensible that supposedly enlightened people propose to cancel the very conditions that have brought about our high standards. They are either morally dishonest, unwilling to look the facts in the face, or they are too ignorant and provincial to see and understand these contemporary and living situations. It does not involve any complex experiment, it does not involve any great mass of complicated apparatus, to see and understand the varying social conditions that exist in this world and the results that develop from the several varieties. That is one of the simplest tasks in the world. It requires merely an ordinary degree of intelligence and a will to investigate. These local conditions in Africa can be visited by automobile, simple, easy travel over good roads and at speeds unbelievably high even as compared with American conditions. There are probably some distant out-posts that are not so easy to visit, but after

all one can travel far up the Amazon Valley in a boat and get into some rather primitive country. With the airplane the remotest section of China is open to study. The Near East, the Far East, all these countries are easily penetrated.

It is far simpler to study and understand the social conditions in these countries than to undertake a research project and bring it to fruition in your laboratory. All it takes is a will to go there and an open mind and an inquiring disposition to gain the fundamental truths that makes one country great and another backward.

I do not wish to infer that all countries present exactly equal opportunity, but nature has provided vast resources, widely distributed and in those countries favored with climate, soil, and minerals, all that is needed is freedom of the type here discussed, to bring about revolutionary development of the social condition. This cannot be done except as the will of the people demands this freedom, and the demagogue with his false preaching is excluded.

**"The Truth Will Prevail"**

The motto on your medal is very appropriate and in the long run it is a true statement. Some of us see no necessity, however, of too long a wait, therefore, it is our problem to decry the demagogue, the falsifier and insist upon immediate truth, truth open and above-board, and only truth.

For many, many years the chemist has been making contributions to the welfare of the world about him. He has developed a fundamental science to a high degree of perfection, and, operating under its laws has contributed a thousand products fundamentally important in our present economic development. There is not a field of human activity to which he has not contributed greatly, and all industry is dependent on the products of his factories. He has given us new compounds, medicinals, metals and alloys, new textiles, new coating compounds, a list far too long to even touch upon. Their service has been of incalculable value.

We are now in a war for the preservation of our nation, of our estate, of our very freedom. It is the chemist who has contributed so largely to the materials of defense, the explosives, the strong metals, the light alloys, the medicines. In fact our whole defense structure on the material side traces back to the chemist and his laboratory. No one mentions

these things in public life. The very industries that produce them, for a long time were damned publicly. They are not now praised.

Pushed from this point of attack by unmistakable examples of production, our political leaders have now centered their attack on the individual. Must we consider that we are now coming into a new era in which the outstanding inventive minds and skilled fingers of our technicians are to disappear? Is this future world to be only the world of common people, or of the have-nots? Where people like your good individual selves are no longer wanted, and you are to be leveled down simply because your individual industry and thrift pushed you a bit above the level of the African native? That is the way I view this present movement.

This is a pretty pessimistic picture. Industry is now to be pillaged, and the constructive individuals who made it are to be leveled off, dissipated if you will. Why is this? The political leader knows nothing about science, he doesn't know how you originate things, or how they operate. To him the power that runs the fan in his office comes from the switch on the wall, the sulfanilamide that cures his infection,—well that just happens. He does not know anything about you and your work and your past contributions. He has been told this is all the result of magic, can all be drawn from a hat by anyone. He sees a vast number of men enter a plant gate—these mean political support, they are the only people that count. He is too unintelligent to understand the meaning of that plant gate and what is behind it. He cannot even think so far as to understand that that plant rests upon your service and your contributions, and that without you these individuals would be far fewer in number and dissipated in the wilderness that once was.

You have raised your head above the mass. The politician does not look at the broad and substantially reared platform you are standing on, only at the target that your upstanding head presents. In his gross ignorance he has determined that you shall be knocked down. Now what are we going to do about it?

We have got to exert concerted action, sane, carefully planned, well executed, to show up these political leaders in their true stature, their ignorance of the things they talk about, their unfitness for understanding

their campaigns that destroy. We must disqualify them as informed persons in fields of science, and of industry. We have got to show their ineptitude, their inadequate knowledge of the situation, through the public press, the radio, any other means for the distribution of public information. We have got to show that we do not and never have pulled rabbits out of hats, because if they believe that is the way our task is performed, then they will be certain that they do not need the chemist. We have to do this in an intelligent and telling way. We must rid ourselves of some of the unnecessary jargon that has crept into our language. It may be all right in the laboratory, but it is unsuited to general public education. It is not a mark of intelligence. If we do not take these steps and make them effective then we have arrived at the end of the road and we deserve to be reverted to the status of the native. Our living standards will then drop far. Social leveling goes only one way and that is downward.

The time for concerted action of all technically trained men is here, now. Let us apply the principle of coöperation that has carried us so far in our technological development, and strike down this evil monster of crass ignorance that is about to overwhelm us. And do not forget that we have among us those who do not understand the import of some of these things. They have never been to China, Africa, the great undeveloped areas of the world. They don't know what they are facing. Let us not overlook the home front in our campaign.

## Messages of Congratulation

The presentation of the medal award to Dr. Walter S. Landis brought felicitations from many leaders in the world of science and education. Among those who sent messages of congratulation are:

Frederick S. Bacon, Chairman, Northeastern Section, American Chemical Society

Dr. A. F. Blakeslee, Department of Botany, Smith College, Massachusetts

Dr. Isaiah Bowman, President, Johns Hopkins University, Baltimore, Maryland

Dr. Marston T. Bogert, Department of Chemistry, Columbia University, New York, N. Y.

Dr. F. G. Cottrell, 3904 Ingomar Street, N. W., Washington, D. C.
Gano Dunn, The J. G. White Engineering Corporation, 80 Broad Street, New York, N. Y.
Dr. Albert K. Epstein, The Emulsol Corporation, Chicago, Illinois
Dr. Harry L. Fisher, U. S. Industrial Chemicals, Inc., Stamford, Conn.
Dr. J. A. Fleming, Carnegie Institution of Washington, Director, Department of Terrestrial Magnetism
Dr. Charles N. Frey, The Fleischmann Laboratories, New York, N. Y.
Henry Gilman, Iowa State College of Agriculture and Mechanic Arts
Dr. H. W. Graham, Director of Metallurgy, Jones and Laughlin Steel Corporation
Arthur Guillaudeu, 6536 South Cambell Avenue, Chicago, Illinois
J. E. Hawkins, Department of Chemistry, University of Florida
Dr. C. Judson Herrick, 236 Morningside Drive, Grand Rapids, Michigan
Robert W. Hindley, Crandon-Forest Company, Wisconsin
Zay Jeffries, General Electric Co., Cleveland, Ohio
Armin Otto Leuschner, 1816 Scenic Avenue, Berkeley, California
Frank O. Lundstrom, Bureau of Plant Industry, Beltsville, Maryland
Dr. W. H. MacIntire, Head, Department of Chemistry, The University of Tennessee, Knoxville, Tennessee
Dr. Robert A. Millikan, California Institute of Technology, Pasadena, California
Dr. Marston Morese, Princeton, New Jersey
Dr. D. Pyzel, 50 West 50th Street, New York, N. Y.
Dr. E. E. Rall, President, North Central College, Illinois
Frederick D. Rossini, Chemist, U. S. Department of Commerce, Washington, D. C.
Dr. Shapley, Harvard College Observatory, Cambridge, Massachusetts
R. Norris Shreve, Professor of Chemical Engineering, Purdue University, Lafayette, Indiana
Dr. Foster D. Snell, Foster D. Snell, Inc., 305 Washington Street, Brooklyn, N. Y.
Edward J. Sparling, President, Central Y.M.C.A. College, Chicago, Ill.
T. W. Vaughan, 3333 P Street, N. W., Washington, D. C.
Dr. Donald D. Van Slyke, The Hospital of the Rockefeller Institute for Medical Research, New York, N. Y.
John M. Weiss, John M. Weiss and Company, 50 East 41st Street, New York, N. Y.

Dr. M. C. Whitaker, American Cyanamid Company, 30 Rockefeller Plaza, New York, N. Y.

Dr. Henry G. White, Vassar College, Poughkeepsie, New York

Dr. F. C. Whitmore, Dean, The Pennsylvania State College, State College, Pennsylvania

Willis R. Whitney, General Electric Company, Schenectady, New York

J. N. Wickert, Carbide and Carbon Chemicals Corporation, South Charleston, West Virginia

Dr. A. C. Willard, President, University of Illinois, Urbana, Illinois

V. K. Zworykin, R. C. A. Manufacturing Company, Inc., Princeton, New Jersey

# Morris A. Pozen

It is with deep regret that THE AMERICAN INSTITUTE OF CHEMISTS records the death of Morris A. Pozen on September 29, 1942, in Brooklyn, New York.

Dr. Pozen was born February 4, 1887, in Russia, and came to America at an early age. He received the Phar.D. degree from George Washington University, and the B.S. degree in chemistry from that University in 1913. From 1909 to 1920 he served as assistant and chief chemist of the Health Department in Washington, D. C. and also as collaborating chemist in the Bureau of Chemistry, United States Department of Agriculture. From 1920 to 1930, he was chief chemist for the Schwarz Laboratories. From 1930 until his death he served as consulting chemist in food chemistry at Brooklyn, New York. He specialized in brewing and food-chemistry fields. He also served as technical editor of *Modern Brewery Age,* and was the author of "Successful Brewing" published in 1935, and of several papers. He was a member of the American Chemical Society. Dr. Pozen became a member of THE AMERICAN INSTITUTE OF CHEMISTS in 1925.

# The American Institute of Chemists
# Committee Reports
# For the Year Ending April 30, 1943

## Annual Report of the Secretary
## 1942-1943

I am pleased to submit this report of the activities of THE AMERICAN INSTITUTE OF CHEMISTS during the season 1942-43.

The National Council held nine meetings during the year with an average attendance of ten councilors and officers.

The following actions upon membership were taken:

**Elections**

| | |
|---|---|
| Fellows | 118 |
| Associates | 33 |
| Juniors | 33 |
| | 184 |
| Reinstated to Fellow membership | 5 |
| Total | 189 |

**Loss of Membership**

*Resignations*

| | |
|---|---|
| Fellows | 26 |
| Associates | 4 |
| Juniors | 4 |
| Students | 1 |
| Total | 35 |

*Dropped*

| | |
|---|---|
| Fellows | 12 |
| Associates | 1 |
| Juniors | 11 |
| Total | 24 |

*Deceased*

| | |
|---|---|
| Honorary Member | 1 |
| Fellows | 12 |
| Total Loss of Membership | 72 |
| Total Increase in Membership | 117 |

**Actions**

| | |
|---|---|
| Associates to Fellows | 6 |
| Juniors to Fellows | 3 |
| Juniors to Associates | 4 |
| Student to Associate | 1 |
| Student to Junior | 1 |

**Membership**

| | May 1942 | May 1943 |
|---|---|---|
| Honorary Members | 5 | 4 |
| Life Members | 9 | 9 |
| Fellows | 1351 | 1433 |
| Associates | 104 | 131 |
| Juniors | 198 | 210 |
| Students | 7 | 4 |
| Total | 1674 | 1791 |

**Necrology**

I regret to make note of the following deaths during the season:

**Honorary Member**

George Charles Lewis

**Fellows**

Barnard S. Bronson
Francis D. Dodge
Clemence Foerster
Henry C. Fuller
Frederick H. Getman
John Helfrich
Iral B. Johns
Henry Granger Knight
John L. Martin
Morris A. Pozen
Avenir Proskouriakoff
Willard Curtis Thompson

There were 100 more members elected this year than were elected last year, and a decrease of twenty-six in resignations during the corresponding period. Twenty-four members were dropped from the rolls this year for various reasons, while none were dropped last year. The present membership, an increase of 117 over last year, is the largest in the history of the INSTITUTE. This increase is evidence that, notwithstanding the present war emergency, the interest in the INSTITUTE upon the part of non-member chemists has not abated, a most encouraging sign for its future growth and for its recognized value to chemists and to the chemical profession.

The various committees have been increasingly active during the year in laying a foundation for a wider appreciation of the value of membership and the results of their efforts will be reflected in the activities of the INSTITUTE in the coming year.

I again wish to express my deep appreciation to my assistant, Miss V. F. Kimball, for her continued valuable, loyal, and conscientious service to me as secretary, which with her capable and successful management of THE CHEMIST, as its editor, deserve the highest commendation of the members of the INSTITUTE.

Respectfully submitted,
Howard S. Neiman, Secretary.

## Annual Report of the Auditor
## 1942-1943

Pursuant to instructions, I have audited your books and records for the fiscal year ended April 30, 1943 and submit herewith a statement of assets and liabilities as at that date, together with a statement of income and expenses for the year and a statement of cash receipts and disbursements.

Cash in the Public National Bank was verified with the monthly bank statements, and satisfactory vouchers were presented for all items under audit.

Dues receivable from members for the current and prior years amounted to $4,530.00 against which there was provided an arbitrary reserve of 50 per cent for delinquent accounts. It was found necessary to borrow $1,000.00 in March 1943 from the Public National Bank in order to meet current operating expenses for the balance of the fiscal year ending April 30, 1943.

The excess of income over expenses for the fiscal year amounted to $1,242.73 and compares with $134.41 for the previous year. Included in net income is an amount of $189.77 which represents the net profit on the publication of THE CHEMIST.

The surplus account on April 30, 1943 was $6,686.43 and represents an increase of $1,242.73 for the year. Total membership increased from 1674 on April 30, 1942 to 1791 on April 30, 1943 as indicated by the detailed schedule of membership changes.

I hereby certify that in my opinion, the balance sheet submitted herewith, and the related statements of income and expenses, correctly present the financial position of THE AMERICAN INSTITUTE OF CHEMISTS on April 30, 1943, and are in accordance with the books and records.

Respectfully submitted,
Jacob A. Lichtenfeld,
Certified Public Account.

## TREASURER'S REPORT

### Schedule of Income and Expenses for the Year Ended April 30, 1943

**Income**

| | | |
|---|---|---|
| Members Dues, 1942-1943 | | $7,582.50 |
| Less Reserve for Chapter Refunds | | 513.66 |
| *Net Income from Dues* | | $7,068.84 |
| *The Chemist Publication* | | |
| Income from Advertising | $ 909.50 | |
| Income from Subscriptions | 3,338.20 | |
| *Gross Income* | $4,247.70 | |
| Less Cost of Publication | 4,057.93 | |
| *Net Income from* THE CHEMIST | | 189.77 |
| Total Gross Income for the Year | | $7,258.61 |

**Expenses**

| | |
|---|---|
| Salaries | $3,056.95 |
| Stationery and Printing | 624.42 |
| Secretary Expenses | 24.05 |
| Social Security Taxes | 46.14 |
| Interest on Bank Loan | 15.50 |
| Membership Expenses | 230.43 |
| Telephone and Telegraph | 136.12 |
| Postage | 535.99 |
| Rent and Light | 732.41 |
| Council Meeting Expenses | 45.55 |
| Annual Meeting Expenses | 399.12 |
| Accounting | 125.00 |
| Occupancy Taxes | 1.00 |
| Safe Deposit Box | 9.00 |
| Christmas Gift | 5.00 |
| Licensing Fund | 15.35 |
| General Expenses | 13.85 |
| Total Expenses for Year | $6,015.88 |
| NET INCOME FOR YEAR ENDED APRIL 30, 1943 | $1,242.73 |

## Annual Report of the Membership Committee

### 1942-1943

The importance of a greatly increased membership in the INSTITUTE was brought up at the last Annual Meeting in Atlantic City on May 15, 1942. Plans were made forthwith to select a membership committee consisting of INSTITUTE members well-known in each of the branches of the chemical industry. From a list of names prepared at the Council meeting on June 10, 1942, the following committee was appointed.

Donald Price, Chairman

| | |
|---|---|
| Verne C. Bidlack | Maurice L. Moore |
| A. M. Buswell | Robert J. Moore |
| Joseph Ebert | A. W. Ralston |
| Charles N. Frey | W. T. Read |
| James E. Heckel | Mary L. Sague |
| Hilton Ira Jones | G. E. Seil |
| Frank O. Lundstrom | N. A. Shepard |
| J. J. Mattiello | R. C. Shuey |
| Otto J. Mileti | Maurice C. Taylor |
| Charles G. Moore | A. H. Warth |

Frederick W. Zerban

It was felt that some literature setting forth the aims, activities and achievements of the INSTITUTE, to be used in interesting prospective members, was essential and the task of preparing a membership leaflet was assigned to the chairman. The material for this leaflet was discussed at several Council meetings and the suggestions offered by the officers and members of the Council were incorporated therein. The chairman has been very gratified, indeed, by letters received from the members of the Membership Committee, expressing approval of the leaflet and especially wishes to express his indebtedness to Mr. Walter J. Murphy and Miss Vera F. Kimball for valuable assistance in its preparation.

The membership leaflet has now been printed and a supply sent to each member of the Membership Committee, with a letter from the chairman. A membership campaign is to be carried out and it is felt that the most effective means of doing so is by direct contact through acquaintances who are familiar with the personal background of the prospective members. Each member of the INSTITUTE is urged to secure at least one desirable new member.

Mr. Lloyd W. Davis, Chairman of the Membership Committee of the New York Chapter has set a fine example of what can be done to further the campaign. Mr. Davis has prepared a well-written letter, presenting arguments for membership in the INSTITUTE and this has been mailed to every member of the Chapter, along with a copy of the membership leaflet, and an application blank.

Thanks are especially due to Dr. Robert J. Moore and President Gustav Egloff, whose efforts are largely responsible for considerable net increase in membership, even before the launching of the present membership campaign.

Respectfully submitted,

Donald Price, Chairman.

## Annual Report of the Committee on Licensing of Professional Chemists 1942-1943

The question of State licensing of professional chemists was brought to the forefront of the activities of THE AMERICAN INSTITUTE OF CHEMISTS by appointment in the Fall of 1938 of a Committee on Licenses, with personnel as follows:

*For the Institute*

| | |
|---|---|
| R. C. Benner | Ira Paul |
| F. G. Breyer | H. W. Post |
| R. E. Kirk | F. D. Snell |
| R. J. Moore | Max Toch |
| H. S. Neiman | W. D. Turner |

L. VanDoren

*For the American Chemical Society*

W. W. Winship, Chairman, New York, N. Y. Section.

A. J. King, Chairman, Syracuse, N. Y. Section.

A. L. Marshall, Chairman, Eastern N. Y. Section.

A. G. Scroggie, Chairman, Western N. Y. Section.

Paul T. Sharp, Chairman, Cornell, N. Y. Section.

J. P. Cavelti, Chairman, Erie, Pennsylvania Section.

All under the chairmanship of Joseph W. E. Harrisson.

This committee held its initial meeting on December 21, 1938, and by March, 1939 had a well defined list prepared for a proposed act—"To amend the New York State Education Law, with respect to practice as *Professional Chemist.*"

This was introduced in the New York State Senate and in the New York Assembly on February 7, 1940. However, it met with active opposition or half-hearted support on the part of officers and members of the A. C. S. and was killed in committee.

The act was rewritten to "Amend the New York State Education Law in relation to regulating the practice of *Certified Public Chemists,* and making an appropriation to the Department of Education to defray the expenses in connection therewith", and was again introduced in the Assembly on February 5, 1941, where it met with the same fate.

During the Fall of 1941 and early months of 1942, the act was again redrafted and was brought to the attention of several legislators, but never reached the stage of actual introduction in the Legislature.

During this period the committee consisted of: E. R. Allen, F. G. Breyer, C. N. Frey and Donald Price, under the Chairmanship of William H. Gardner.

In the Fall of 1942, the committee was revamped, and the present membership is as follows: Marston T. Bogert, Frank G. Breyer, Harry L. Fisher, Charles N. Frey, William H. Gardner, Joseph W. E. Harrisson, Raymond E. Kirk, Frank O. Lundstrom, Robert J. Moore, Donald Price, Alvin F. Shepard, Norman A. Sheppard, Foster D. Snell, Maurice C. Taylor, Maximilian Toch, Vanderveer Voorhees, Gustav Egloff (ex-officio), and Howard S. Neiman (ex-officio), under the Chairmanship of William D. Turner.

During the past three years several debates and public discussions have

been held on the subject, and a number of articles published. Records of these discussions, as well as copies of the several drafts of the proposed act, were made available, and constituted the basis upon which the present committee formulated its further program of activities.

The first meeting of the present committee was held November 13, 1942, 6:30 p.m. at The Chemists' Club.

At this meeting, the 1941 draft of the act was carefully studied and with minor corrections and additions, was accepted for presentation to the 1942 New York State Legislature.

It was proposed that a special small committee be appointed to present the Act to the State Board of Regents, with power to make such changes as would secure their approval.

Thereafter, two meetings of the full committee and several meetings of the sub-committee were called. As a result of these activities, arrangements were made with the New York Board of Regents so that two of our members, Doctors Toch and Turner, had the opportunity of presenting the essence of the Bill before the Regents.

Following this, Dr. Toch and Mr. Neiman were appointed as representatives of the sub-committee to proceed to Albany in support of the Bill whenever the time might be ripe. In accordance with this arrangement Dr. Toch proceeded to Albany and met Senator Baum and Assemblyman Davidson, both of whom accorded him a friendly reception. From Senator Baum six copies of the printed Bill in its earlier form were received, and these have been modified in accordance with the rewording suggested by the committee.

Following the meeting with Senator Baum, Doctors Snell and Turner had a meeting with Mr. G. M. Skinner of Senator Ives' Office. Mr. Skinner supplied six copies of the Bill with certain pencil corrections introduced. These were further corrected in accordance with the committee's suggestions and were again placed in Mr. Skinner's hands so that they might be available when the Bill was presented.

Repeated efforts to get the Bill into the hands of a Senator and Representative who would introduce it were of no avail, and when it appeared that the Legislature would be adjourned before the matter could be brought to a head, arrangements were made to have Drs. Toch and Turner proceed to Albany.

On this trip contact was made with Mr. James C. Hagerty, Executive Assistant to Governor Dewey. He gave us some assistance and in turn introduced us to Mr. Walsh of the office of Charles D. Breitel, State Counsel.

These officers have offered to render every assistance to us in getting the Bill before the proper authorities next Fall so that it may be in order well in advance of the next annual assembly.

Respectfully submitted,
Wm. D. Turner, Chairman.

## Annual Report of the Committee on National Legislation Affecting Chemists, and Public Relations

Unquestionably the most important proposed national legislation affecting chemists, that has been proposed in the past twelve months, is the so-called Kilgore Bills, S. 607 and S. 702.

Senate Bill 702 is in a word a duplication of the so-called Kilgore Bill, S. 2721, introduced in the 77th Congress, entitled "Office of Technological Mobilization". S. 2721 failed to be reported out of the Subcommittee on Military Affairs during the 77th Congress.

Senate Bill 607 proposes among other things to set up the following offices within the "Office of War Mobilization": (1) Office of Production and Supply, (2) Office of Manpower Supply, (3) Office of Scientific and Technological Mobilization, and (4) Office of Economic Stabilization.

Senator Kilgore's S. 702 is in substance now simply an elaboration of the broader bill, S. 607, although actually S. 607 and S. 702 are separate bills. The former carries an appropriation of $400,000,000 and provides for a director of the Office of War Mobilization and four administrators appointed by the director with the approval of the President, one administrator, of course, for each of the four so-called offices the bill would create.

S. 702 carries an appropriation of $200,000,000, identical in this respect with S. 2721 of the 77th Congress.

It is generally thought by members of the profession that S. 702 is the most direct attack upon the liberties of technologists yet to have been introduced into the Congress of the United States. It would place in the hands of one individual totalitarian powers and should be met with the severest condemnation possible.

Fortunately, there seems to be little possibility of either of these two bills emerging from the Committee on Military Affairs, at least during the present session of the 78th Congress.

The American Institute of Chemists through its president, Dr. Gustav Egloff, has officially registered its disapproval of these bills in a communication sent to Senator Kilgore, chairman of the Subcommittee on Technological Mobilization of the Military Affairs Committee of the United States Senate. Dr. Egloff has solicited the active support and coöperation of other scientific societies and associations in registering opposition to the measure. The general subject of the Kilgore Bills has been discussed at a number of the local chapter groups in the past year. Among the scientific groups which have registered disapproval of the Kilgore Bills are the American Chemical Society, the Electrochemical Society, and the Professional Engineers' Group.

At the moment the situation as regards proposed changes in the patent law structure is much more favorable than it has been for the past few years. I am particularly pleased to report that in the past year no legislation has been passed that would destroy the basic structure of the patent system. However, it is unlikely that changes will not be suggested and it is highly desirable that all such proposed legislation be scrutinized very carefully.

Respectfully submitted,
Walter J. Murphy, Chairman.

## Annual Report of the Committee on Constitutional Revision

### 1942-1943

The Committee on Constitutional Revision, consisting of E. H. Northey, Chairman, Edward R. Allen, Harry G. Lindwall, Howard S. Neiman, and M. L. Crossley, met December 3, 1942, to discuss Constitutional changes affecting classification of members. It was felt that at present we had little inducement for young chemists to join the INSTITUTE, and that without their support, the INSTITUTE would remain small and impotent.

It was agreed that by changing our present classification of Associate membership, most of the objections could be overcome. Associates would be redefined as those who have had four years of collegiate work in chemistry or chemical engineering, leading to a bachelor degree, in an educational insitution accredited by our Council, and who have in addition, three years of progressive experience or training in practice or profession.

Associates would be empowered to vote on all matters except Constitutional amendments, but only Fellows would hold office. By the latter safeguard it was thought that lowering the standards of the INSTITUTE could be prevented even though our membership grew to be predominantly Juniors and Associates. The present Junior membership would be retained so that the INSTITUTE could hold the interest of recent graduates during the period when they would be subjected to greatest inducement to join labor unions. By making it possible for them to qualify for a voting membership in the INSTITUTE on completion of their required years of experience, the stigma of the word "Junior" would be removed.

Revision was made in accordance with these fundamentals and a number of minor changes in the Constitution which seemed desirable were included. These proposed changes were approved by the National Council. Copies of the changes have been mailed to the membership, and the changes will be voted upon at the Annual Meeting. The Committee feels that passage of these changes is an important step on the road to enlarging our membership and making the INSTITUTE a potent force for the advancement of the professional interests of chemists.

Respectfully submitted,
E. H. Northey, Chairman.

## Annual Report of the Patent Committee

### 1942-1943

No meetings of THE AMERICAN INSTITUTE OF CHEMISTS' Patent Committee were held during the past year. The war effort made very heavy demands on the time of each of the members of the Committee, many of whom serve on Government advisory committees in addition to taking care of their normal business activities.

The Committee feels that it is not advisable to bring up discussions on controversial matters during the present emergency and, therefore, will not submit a report for the past year.

Respectfully submitted,
Gilbert E. Seil, Chairman.

## Annual Report of the Inter-Relations Committee 1942-1943

The Inter-Relations Committee of the INSTITUTE was set up in 1939 to consider questions of dissatisfaction among the membership. Under Chairman Charles A. Marlies the Committee during its first two years investigated such questions and submitted reports on its findings. This work was completed in 1941.

During 1942, your present Chairman was appointed by Dr. Egloff to review cases of members who have sent in resignations for what would appear to be insufficient reason. A number of such cases have been referred to your Chairman, with results that were at least partially gratifying. Mr. Edward M. Hanzely, Baltimore, and Miss Mary A. Rolland, Washington, D. C. have been recently appointed members of the Committee. We hope to make this Committee of still greater value.

Respectfully submitted,
A. H. Warth, Chairman.

## Report of the Editor of The Chemist 1942-1943

During the past year the general policies of the INSTITUTE, supported by the publication, resulted in an increase of membership of about seven per cent. This increase in membership in addition to outside subscriptions brought an additional income to THE CHEMIST of twenty-seven per cent, or about $700.00. Publication costs increased somewhat during the year, principally caused by an average increase in the size of the journal.

One of the main objectives of the INSTITUTE is to tell the general public what a chemist is and what he does, and that the members of the INSTITUTE are professional men, wholly competent and thoroughly trained. THE CHEMIST has actively supported the policy of professional consciousness among chemists.

Unusual interest among chemists and the public has been expressed in the articles which were published this year. We are grateful to Dr. Egloff and the Chicago Chapter for supplying much of this material.

THE CHEMIST is not only a connecting link between the widely separated members of the INSTITUTE but is also a powerful and convincing influence in presenting the objectives of the INSTITUTE to those who are not members.

The number of book orders increased during the year, and we are glad to be of this service to our readers.

Active coöperation was shown by our contributing editors and by the reporters from the various chapters, which increased interest in the activities of the local groups.

We are grateful for the coöperation of all who contributed to THE CHEMIST; to Mr. Walter J. Murphy as Chairman of the Editorial Advisory Board, for his sympathetic understanding of the problems of publications; to Dr. Egloff and the National Council for their support; and to Secretary Neiman for kindly guidance and assistance.

Respectfully submitted,
V. F. Kimball, Editor

## Annual Report of the Committee on Ethics

### 1942-1943

Your committee received its appointment in November, 1942. All the members have signified their willingness to stand by for business.

No ethical offenses having been brought to our attention during the year, we report with pleasure a clear calendar.

Respectfully submitted,
Arthur Burwell,
M. L. Crossley,
Wm. M. Grosvenor,
Raymond E. Kirk,
Charles L. Thomas,
W. D. Turner, Chairman.

## Annual Report of the Committee on Unemployment

### 1942-1943

Commi.tee has held no meetings and has not been active during the past fiscal year. The reasons for this are, of course obvious.

Respectfully submitted,
Edward R. Allen, Chairman.

## Annual Report of the Chicago Chapter

### 1942-1943

In the past those members of THE AMERICAN INSTITUTE OF CHEMISTS living in and near Chicago have been rather isolated from the main body of THE AMERICAN INSTITUTE OF CHEMISTS whose activities have largely been in the east. Some previous attempts to establish a Chicago Chapter did not meet with much success, probably owing to the relatively small membership in the Chicago region. In the spring of 1942 a new effort was made by a small group of the members to establish a Chicago Chapter. At a meeting on May 27, 1942, a temporary chairman, vice-chairman and secretary-treasurer were selected and following that meeting the work of organization has gone forward steadily. Six meetings were held, all of them open to chemists both members and non-members alike with the exception of one business meeting. From the beginning it has been apparent that the success of the Chicago Chapter depends upon increasing the membership to a workable minimum. Excellent coöperation has been obtaincd from the members and as a result the membership of the INSTITUTE in the Chicago area has increased by fifty per cent. This in itself indicates a very considerable interest in the work of THE AMERICAN INSTITUTE OF CHEMISTS.

At the meeting in January there was adopted a constitution and by-laws patterned after those of the New York Chapter. In order to defray mailing costs for meeting notices and other expenses, a small assessment of dues has been made with encouraging response from the membership, a further indication that establishment of an active Chicago Chapter is assured.

At the May meeting a year ago Mr. John A. Dienner of the patent

law firm of Brown, Jackson, Boettcher & Dienner gave a very interesting address on various proposed changes in our patent laws and their effect on chemists.

A business meeting was held on June 19, 1942, for organization and election of officers.

At a meeting on September 18, 1942, Dr. Otto Eisenschiml gave an address entitled "The Chemist in Three Wars". He made the proposal that technical observers accompany military forces, into the battlefronts when necessary, to report directly on the performance of military equipment.

On November 20, 1942, a meeting was held at the Adventurers Club in honor of the seventy-fifth birthday of Professor Vladimir Ipatieff. Addresses were given by Professor F. C. Whitmore, Professor Ward Evans, Professor Ipatieff and Dr. Egloff.

The meeting of January 15, 1943 was addressed by Mr. H. E. Wiedemann, consulting chemist of St. Louis, on the subject of "The Professional Chemist and Unionism". Lively discussion followed Mr. Wiedemann's address, the tenor of which was that chemists must develop their own professional organization if they are to avoid being swallowed up by the trade union movement.

At a meeting on March 25, attended by about two hundred chemists, four speakers discussed the proposed regimentation of scientists embodied in Senate Bills 607 and 702 introduced by Senator Kilgore. Dr. Arthur Guilleaudeu of Swift & Company took charge of the discussion and the subject was ably treated by Mr. Robert C. Brown, Jr., Chairman of Associated Defense Committees, Chicago Technical Societies, Dr. H. A. Wagner, Past President of the American Association of Engineers, and Professor Harry McCormack, Director of Chemical Engineering, Illinois Institue of Technology.

The success of this first year would not have been possible without the excellent coöperation of many members, and The Chapter is especially indebted to President Egloff for the time and thought he has devoted to its activities. The prospects for the coming year are very good, especially considering the increasing need for a professional organization to serve chemists and chemical engineers in the Chicago region.

Respectfully submitted,
Vanderveer Voorhees, Chairman.

## Annual Report of the New York Chapter 1942-1943

The New York Chapter has had a very successful year as indicated by large attendance at its meetings, the active work of its committees, and increased membership of the Chapter. This is especially gratifying in view of the difficulties imposed by the war.

*Meetings:*

Three meetings of the Chapter were held at The Chemists' Club, then because of rationing difficulties the meeting place was changed to the Building Trades Employers Association, 2 Park Avenue. A very successful meeting was held at this location and the Annual Meeting scheduled for Friday, May 21st, will also be held there.

1. October 23, 1942. A Testimonial Dinner was given in honor of our National President, Dr. Gustav Egloff. "The Personal History of Egloff the Author" was given by Dr. Robert J. Moore, of the Bakelite Corporation. "Egloff the Petroleum Expert" was the topic of Colonel George A. Burrell, president of the Atlantic States Gas Company, New York. Col. Burrell told the now famous anecdote about the time during the course of a patent suit when the opposing patent attorney asked Dr. Egloff to tell everything he knew about petroleum emulsions. Whereupon for twenty-one days the story of emulsions was told in great detail, to the attorney's utter disgust! "The Influence of Egloff on the Progress of American Chemistry", was discussed by Prof. Marston T. Bogert of Columbia University.

In adddition to these scheduled speakers we were honored by the presence of Mr. Hiram J. Halle, president of the Universal Oil Products Company, and Dr. Robert Wilson of the Pan American Petroleum Company, who gave very interesting reminiscences of their long association with Dr. Egloff.

Telegrams were read congratulating Dr. Egloff from all parts of the country. A special tribute was paid by his associates in the Universal Oil Products Company. Following these testimonials Dr. Egloff spoke on "The Struggle for Oil and Its Products"; a topic which was not only timely but had vital appeal to all who were present, including the ladies.

2. On Friday, December 18, 1942, Dr. Ralph H. Ball, Chief of the Thermoplastics Unit, Plastics and Synthetic Rubber Section, Chemical Division, Commodity Bureau, War Production Board, gave a very interesting and timely talk on "Raw Material Supplies for Plastics Manufacture". Dr. Ball discussed the various classes of plastics and their availability based on manufacturing capacity, war needs and raw materials supply. He also discussed some of the more important war uses for these products and indicated the tremendous expansion which the war has brought about.

In the business meetings the Kilgore Bill, on which hearings were then being held in Washington, was briefly discussed. This bill provided for the creation of an "Office of Technological Mobilization" which would place all science and technology directly under government supervision. The INSTITUTE through its National Council was on record as opposing this bill on the grounds that the dislocation of research which the bill would entail might well lose the war for us. Members were urged to voice their opposition to the bill with their Senators.

3. Dr. Howard I. Cramer of Sharples Chemicals, Inc., gave an excellent review of the "Situation on Synthetic Rubber", on January 29, 1943, illustrating with a great many lantern slides and by more than one hundred samples of various products included in the synthetic rubber program.

At the business session the proposed changes in the Constitution, changing the status of the Associate members, was discussed. It was also announced that while the Kilgore Bill died with the old Congress, it would undoubtedly be reintroduced, and that both the National and local Councils were watching the situation closely. Report was also made that the Committee on Licensure was actively trying to get a bill introduced into the New York Legislature.

4. On April 16, 1943, Dr. Gustav Egloff presented student medals to eleven students from various colleges of the New York area and stressed the point that the United States was now leading the world in chemical research and products, and it was no longer necessary to go to Europe to study chemistry. He welcomed these students into Junior Membership of the INSTITUTE and in presenting the medals gave appropriate personal remarks to each recipient.

The subject of the Kilgore Bills which had been reintroduced into the present Congress, and which were even more radical than the old bill, was discussed briefly by Dr. Egloff. He warned that the attitude of those who maintain that the bill does not have a chance of passing, and that the less publicity given it, the better, is not to be relied on as sound advice, based on the precedent of what happened during the last war through the passage of the Volstead Act. This again was a bill which "could not pass", but did. All members were strongly urged to write their Senators in opposition to this bill. Failure to get introduction of the Licensure Bill into the Legislature was reported and the bitter disappointment of all members of the Licensure Committee and Council was expressed. The Committee is maintaining active work and is trying to interest the Governor in this bill so as to assure its introduction next year.

A report of the Nominating Committee, consisting of R. H. Kienle, Chairman, R. E. Kirk and Harry L. Fisher, was read. Marston L. Hamlin was nominated as Chairman of the New York Section; Franklin H. Bivins, Vice-Chairman; Lloyd W. Davis, Secretary-Treasurer; A. Lloyd Taylor, Chapter Representative; George L. Royer, Leonard P. Moore, H. F. Wakefield, as Councilors. John E. Schott was nominated as Councilor from the floor.

Following the business session Mr. Fred C. Foster, candidate for a Ph.D. at Columbia, gave his "Impressions of Interviewing from the Student's Standpoint", based on his experience in being interviewed by more than 15 companies during the past winter. Mr. Foster is to be congratulated on his frank and detailed discussion of his experiences, which were of high value to many members of the INSTITUTE who interview prospective chemists in their daily work.

Miss Jane G. West, candidate for a B.A. at Smith College, discussed her "Impressions of Interviewing from the Woman Student's Viewpoint". Miss West gave very excellent discussion on her subject which greatly supplemented Mr. Foster's remarks, since Miss West was interviewed by employers seeking technicians and control chemists rather than chemists for fundamental research.

Miss Lois W. Woodford of the Stamford Research Laboratory, American Cyanamid Company, closed the discussion by giving "The Employer's Viewpoint of Interviewing and the Employment of Chemists". Miss Woodford detailed the system of handling prospective employees in use at Stamford, and illustrated from her wide experience in this work. She drew the parallel that, much as in the producing and selling of a new product, the chemist, in seeking employment had to sell the company on the quality of his work.

Approximately one hundred members and guests attended this meeting

and were enthusiastic about the novel and interesting program which was presented.

5. The final meeting of the year will be held on May 21, 1943, and will include the Annual Business Meeting. Following this, Mr. M. D. Crawford, Editor of Fairchild Publications, and an authority on ancient fabrics, will give a talk on the "Early History of Dyeing and Fabric Construction". It will be illustrated with colored slides and will reveal some of the factors entailed in the style and design of modern clothes. This is a subject which should be of general interest and appeal, particularly to the ladies who are especially invited to this meeting.

*Committees*:

The Program Committee consisted of Dr. G. L. Royer, Chairman, Mr. W. W. Winship and Dr. F. W. Zons. The committee is to be highly congratulated on the excellence of the programs this year.

The Membership Committee consisting of Dr. Lloyd W. Davis, Chairman, Dr. Lloyd R. Denslow, Mr. M. H. Gwynn and Mr. E. H. Schmidt, were active in starting a membership campaign, which though late in being launched, because of delay in printing the new brochure issued by the National Council, is expected to bring in a number of new members before the year is out. A letter has been written to accompany the new brochure. This points out the advantages of membership in the INSTITUTE and urges each present member to secure at least one new member this year.

The Committee on Professional Problems; Dr. B. L. West, Chairman, Dr. S. M. Newmark and Dr. J. W. Robertson, followed closely the work of the ceommittees of the National Council on the Kilgore Bills, patent legislation and the Licensure Bill, but held no formal meetings during the year because these questfons seemed to be adequately handled by the National organization.

*Chapter Council*:

Because of urgent war work Dr. Milton Burton was forced to resign as Chapter Representative of the New York Chapter. On request of the Council, Dr. Marston L. Hamlin agreed to continue this office. The balance of the Council consisted of Franklin H. Bivins, Dr. R. R. Denslow, Dr. Joseph Mattiello, Dr. John H. Schott, Dr. V. H. Turkington, Dr. B. L. West, Mr. W. W. Winship, Dr. Donald Price (ex-chairman), and Chapter Officers, Dr. E. H. Northey, Chairman, Dr. Paul J. Witte, Vice-Chairman, and Dr. A. Lloyd Taylor, Secretary-Treasurer, has held four meetings during the year. The Council has done excellent work in managing the affairs of the Chapter and it is to be congratulated on having kept the expenditures of the Chapter well under its income for the year. Drs. Northey, Price and Hamlin have attended most of the meetings of the National Council and have seen that the New York Chapter worked in close coöperation with the National Council.

*Expenditures*:

The expenditures for the year have been well under the income. This is partly because of increased income from the new members. An auditing committee consisting of Dr. L. W. Davis and Dr. J. E. Schott have been appointed to audit the books of the Secretary-Treasurer prior to the Annual Meeting.

*Acknowledgment*:

The Chairman wishes to express his appreciation for the loyal support given him throughout the year by the officers, members of the Council and members of the various committees which have contributed so largely to the successful year enjoyed by the New York Chapter. He deeply appreciates the honor of having served as Chairman, and sincerely wishes success to the incoming officers.

Respectfully submitted,
E. H. Northey, Chairman.

## Annual Report of the Niagara Chapter

### 1942-1943

My report of the activities of the Niagara Chapter is nothing to be proud of this year.

The last official meeting was held last June at the University of Buffalo Campus. Five or six fellows attended the dinner and meeting. Since there were so few present, business was dispensed with. Frederick Koethen discussed the interesting subject to Western New Yorkers, "The History of the Niagara Frontier".

During the winter, questionnaires were sent out to the thirty-one members to obtain the general opinion of carrying on meetings. Ten were returned; six voted to continue, three voted to discontinue meetings, and one suggested news letters for the duration. Consequently, no meetings have been held.

Transportation is a problem in this section which adds to the discomforts of members who would attend otherwise.

An Executive Committee Meeting is being planned for the week of May 9th.

An Official Chapter Meeting will be held this month for the election of officers.

Respectfully submitted,
L. M. Lawton, Chairman.

## Annual Report of the Pennsylvania Chapter

### 1942-1943

During the 1942-43 season the Pennsylvania Chapter of THE AMERICAN INSITTUTE OF CHEMISTS held six technical and professional meetings at the Central Y.M.C.A. and at the Christian Association Building of the University of Pennsylvania. These meetings were preceded by dinner. A list of the meetings, speakers and topics follows:

1. October 27, 1942. Mr. Hobart Kraner, Bethlehem Steel Company. "Unusual Patents Granted by the U. S. Patent Office".

2. November 24, 1942. Mr. John A. Tauber, E. J. Lavino & Company. "The Industrial Applications of X-Ray Diffraction".

3. January 26, 1943. Mr. H. F. Wakefield, Bakelite Corporation. "Synthetic Resin Plastics".

4. February 23, 1943. Dr. Harry L. Fisher, U. S. Industrial Chemicals, Inc. "The Synthetic Rubber Problem".

5. March 30, 1943. Dr. Donald Price, National Oil Products Company. "Some Problems Facing the Chemical Profession".

6. April 27, 1943. Dr. J. J. Willaman, United States Department of Agriculture. "The Chemurgy of Apples and Vegetables".

Abstracts of all these addresses have been, or will be, published in THE CHEMIST.

The average attendance was 20 at dinner and 39 at the meetings.

The Treasurer reported cash on hand $66.74 on October 27, 1942, and $47.41 on April 27, 1943.

At the April meeting the following were elected to take office June 1: Chairman, Dr. Clinton W. MacMullen of Rohm and Haas Co.; Vice-Chairman, Dr. Glenn E. Ullyot of Smith, Kline and French Laboratories; Secretary-Treasurer and Reporter, Mr. Kenneth E. Shull of Philadelphia Suburban Water Co.; and Council Representative, Mr. John M. McIlvain of The Atlantic Refining Company.

A regular schedule of Executive Committee meetings not being feasible this year, much more than usual of the Chapter's business outside of meetings has been conducted by letter or telephone. It is gratifying that despite adverse conditions the Chapter has successfully continued its function of promoting professional consciousness among chemists. Acknowledgment must be made of the major contributions to this success by the Program Committee under Vice-Chairman M. L. Moore and the Dinner Committee under Mr. H. M. Olson. Dr. Moore's removal from Philadelphia to Detroit takes from the Pennsylvania Chapter a loyal friend and hard worker.

Respectfully submitted,

John M. McIlvain, Chairman.

## Annual Report of the Washington, D. C. Chapter

### 1942-1943

Four regular meetings were held during the year. A marked decrease in attendance is no doubt partly explained below and may be due in part to the increase in working hours for Federal employees from 39 to 48 hours per week, and war time restrictions on the use of private autos.

Reorganization of various bureaus of the U. S. Department of Agriculture, and the transfer of all research in this Department to field stations, particularly the four regional laboratories, and the Beltsville Research Center, has resulted in the transfer from Washington of more than fifty per cent of the members of the Washington Chapter during the past two years. We particularly miss the support of the younger, more active members who have been lost because of these transfers.

Service in the armed forces has also caused the temporary loss of about twelve members, especially the recent Student Medal Awards winners of the past two years.

The state of flux and sudden changes constantly occurring by virtue of Executive Order, changes in Civil Service directives, and regulation by War Man Power Commissioner McNutt, have made the aims and objectives program for the profession of chemist most difficult to pursue.

However, by resolution and correspondence the Chapter effectively supported the Mead-Ramspeck Bill setting up a more liberal retirement system for Federal employes, particularly professional employes. This bill as passed also initiated a system of automatic pay raises every eighteen to thirty months, dependent on efficiency rating, type of work, and classification. The Federal employe has also benefitted by the Ramspeck overtime pay bill. This results in an increase of 21.6 per cent in pay for the first $2900 of salary, thus compensating the employe for increase in working hours.

The following programs were held:

May 29, 1942: Dr. Donald H. Andrews, Professor of Chemistry, The Johns Hopkins University, Baltimore, Md. Subject: Opportunities for Service of Young Chemists in the Post-War World. Annual Election of Officers and Reports of Committees.

Oct. 9, 1942: Colonel M. B. Chittick, Chief, Engineering Branch, the Chemical Warfare Service, War Department. Subject: The Chemical Warfare Service. The meeting was preceded by dinner at the Club Studio.

Feb. 9, 1943. Dr. Leonard P. Schultz, Curator of Fishes, U. S. National Museum. Subject: Venezuela, South America (Illustrated).

March 13, 1943: Dr. Gustav Egloff, President, A. I. C., Director of Research, Universal Oil Products Co., Chicago, Ill. Subject: Scientific, Technological, Inventive and Industrial Mobilization. The annual dinner in honor of the national president preceded the meeting.

The following committees served during the year:

Advisory: J. R. Adams, W. H. Ross, M. S. Anderson, F. O. Lundstrom, R. B. Deemer, C. W. Whittaker.

Membership: F. O. Lundstrom, J. W. McBurney.

Nominations: J. R. Adams, R. B. Deemer, F. O. Lundstrom.

Reporter to THE CHEMIST: T. H. Tremearne.

Student Medal Awards: Miss Mary Rolland.

Meeting Place: T. H. Tremearne, L. R. Heiss.

The chairman wishes to express his appreciation for the excellent coöperation and work done by the officers and members of these committees as they have given freely of their time, energy, and thought to the success of the Chapter throughout the year.

Respectfully submitted,
Lewis F. Rader, Jr., Chairman.

Eugene C. Medcalf, A.A.I.C., was recently made assistant manager of Division N at Calco Chemical Division of American Cyanamid Company, Bound Brook, N. J. He has been associated with Calco for ten years as chemical engineer.

The June issue of *Fortune* magazine carries an article on "High Octane", which describes the mass production of high-octane fuel for war purposes, and the possible peacetime use of such power in the automotive and private aviation fields.

# COUNCIL

OFFICERS

*President,* Gustav Egloff
*Vice-president,* Donald Price
*Secretary,* Howard S. Neiman
*Treasurer,* Frederick A. Hessel

COUNCILORS

Donald H. Andrews
Frank G. Breyer
Stuart R. Brinkley
Harry L. Fisher
Donald B. Keyes
Raymond E. Kirk
Frank O. Lundstrom
Robert J. Moore
Foster D. Snell
W. D. Turner

CHAPTER REPRESENTATIVES

*New York*
Marston L. Hamlin
*Niagara*
A. W. Burwell
*Philadelphia*
Gilbert E. Seil
*Washington*
Albin H. Warth
*Chicago*
Vanderveer Voorhees

## May Meeting

A meeting of the National Council of The American Institute of Chemists was held on Saturday, May 15, 1943, in the Berwyn Room of the Edgewater Beach Hotel, Chicago, Illinois, at 12:00 p.m. President Gustav Egloff presided.

The following officers and councilors were present:

Messrs: E. R. Allen, G. Egloff, R. J. Moore, W. J. Murphy, H. S. Neiman, D. Price, M. Toch. Dr. W. T. Read and Miss V. F. Kimball were present.

The minutes of the previous meeting were approved.

The Secretary announced the election of the following new councilors: Drs. Donald B. Keyes, Raymond E. Kirk, and Mr. Frank G. Breyer.

After discussion of the Treasurer's report and methods for carrying on the work connected with the Treasurer's office, this matter was carried over until the next meeting of the Council.

Upon motion made and seconded, Dr. Frederick Hessel, president of Montclair Research Laboratories, was appointed treasurer to complete the unexpired term of Mr. Murphy.

Upon motion made and seconded, other matters to be brought to the attention of the Council were postponed until the next meeting, because of lack of time.

There being no further business, adjournment was taken.

## Board of Directors' Meeting

A meeting of the Board of Directors of THE AMERICAN INSTITUTE OF CHEMISTS was held on Saturday, May 15, 1943, in the Berwyn Room of the Edgewater Beach Hotel, Chicago, Illinois, at 12:45 p.m.

President Gustav Egloff presided.

The following directors were present:

Messrs: E. R. Allen, G. Egloff, W. J. Murphy, H. S. Neiman, D. Price.

Dr. R. J. Moore, Dr. W. T. Read, Dr. W. Toch, and Miss V. F. Kimball were present.

Upon motion made and seconded, the following resolution was adopted:

RESOLVED, That the Board of Directors of THE AMERICAN INSTITUTE OF CHEMISTS, INC., at the meeting held on May 15, 1943, does hereby accept, confirm, and affirm all of the acts of the National Council on behalf of THE AMERICAN INSTITUTE OF CHEMISTS, INC., during the year ending April 30, 1943.

There being no further business, adjournment was taken.

## New Applications For Membership

*For Fellows*

**Botti, Edmond Charles**

*Research Chemist,* E. I. du Pont de Nemours, Pigment Division, 256 Vanderpool Avenue, Newark, N. J.

**Chatenever, Alfred**

*Chemist,* Matam Corporation, 45-17 Pearson St., Long Island City, N. Y.

**Drewson, Pierre**

*Chemical Engineer,* The Hinde and Dauch Paper Company, Sandusky, O.

**Houghton, Dorothy**

*Assistant Professor of Home Economics,* (Chemistry), Teachers College, Columbia University, New York, N. Y.

**Hunter, James H.**

*Vice-president in Charge of Production,* Columbia Recording Corporation, Bridgeport, Conn.

**Payne, Ruth L.**

*Chief Chemist,* Connecticut Telegraph and Electric Company, Great American Industries, Inc., Meriden, Connecticut.

**Santoro, Wilfred E.**

*Chief Chemist,* Standard Varnish Works, Elm Park, Staten Island, New York.

**Schaefer, Karl Theodor**

*Superintendent of Textile Laboratory,* North American Rayon Corp., Elizabethton, Tennessee.

**Tausz, Jenoe Eugene**

*Research Chemist,* L. Sonneborn Sons, Inc., 88 Lexington Avenue, New York, N. Y.

**Tausz, Marta**

*Research Chemist,* Pierre Diamond Importing Co., 630 Fifth Avenue, New York, N. Y.

**Tomlinson, William Robert**

*Chemist,* Picatinny Arsenal, Dover, New Jersey.

*For Associates*

**Abbot, Ruth**

*Research Chemist,* Calco Chemical Division of American Cyanamid, Bound Brook, N. J.

**Polakoff, Nathan**
*Chemist,* Wood and Selick, Inc., 36 Hudson St., New York, N. Y.

**Pollock, Dorothy L.**
*Chemist,* Calco Chemical Division of American Cyanamid Company, Bound Brook, New Jersey.

*For Juniors*

**Calcote, Hartwell Forrest**
Student Assistant, Catholic University of America, Chemistry Department, Washington, D. C.

**Morris, William N.**
*Assistant Supervisor of Laboratories,* Atlas Powder Company, Weldon Spring Ordnance Works, Weldon Spring, Missouri.

**Riener, Thomas W.**
*Assistant Chemist,* Resinous Products and Chemical Company, Bridesburg, Philadelphia, Pa.

**Riley, William C.**
*Bacteriological Chemist,* Crown Cork and Seal Company, Highlandtown, Baltimore, Maryland.

# CHAPTERS

## Chicago

*Chairman,* Vanderveer Voorhees *Vice-chairman,* Hilton I. Jones

*Secretary-treasurer,* Charles L. Thomas

Universal Oil Products Company

Riverside, Illinois.

Dr. Egloff and Student Medalists at Annual Meeting.

Left to right: Margaret Dahm, De Paul University; Keith McLane, University of Wisconsin; Lee Subluskey, Loyola University, and Mrs. Peter Blasco (for Peter Blasco) Illinois Institute of Technology.

## New York

*Chairman,* M. L. Hamlin *Vice-chairman,* Franklin H. Bivins

*Secretary-treasurer,* Lloyd W. Davis

National Oil Products Company

Harrison, New Jersey

*Council Representative,* A. Lloyd Taylor

A MEETING was held on April 16th at the Building Trades Employers Association, Number Two Park Avenue, New York, N. Y. Dr. Gustav Egloff presented the Student Medals awarded by the New York Chapter to the following: Thomas R. Sweet, Queens College; Mary Lucille Confessore, College of Saint Elizabeth; Dwight H. Johnson, Polytechnic Institute of Brooklyn; Charles Tanford, New York University; Shirley Weisenfeld, New York University; Charles Joseph Albisetti, Jr., Rutgers University; William Eric Jensen, Newark College of Engineering; Richard Harry Bernstein, Columbia University; Robert Gold, The College of the City of New York; Arthur Nowick, Brooklyn College, and Joseph J. Smith, Fordham University.

The subject of the meeting was "Interviewing and Employing Prospective Chemical Employees". Three speakers contributed stimulating papers. Mr. Frederick C. Foster, a candidate for the Ph.D. degree at Columbia University, talked on "Impressions of Interviews from the Student's Viewpoint". Miss Jane G. West, a candidate for the B.S. degree at Smith College, spoke on "Impressions of Interviews from the Woman Student's Viewpoint". Miss Lois W. Woodford, of the Stamford Research Laboratory of the American Cyanamid Company, then discussed "The Employer's Viewpoint of Interviews". These papers will be published in a later issue of THE CHEMIST.

### May Meeting

A meeting was held on May twenty-first, at which the following new Chapter officers were elected: Chairman, M. L. Hamlin; Vice-chairman, Franklin H. Bivins; Secretary-treasurer, Lloyd W. Davis; Chapter Representative, A. Lloyd Taylor; Councilors: George L. Royer, John E. Schott, and H. F. Wakefield.

Mr. M. D. C. Crawford, research editor of Fairchild Publications, spoke on "The Tradition of the Arts of Dyeing", and illustrated a most interesting talk with colored slides of beautiful ancient fabrics. This paper will appear in a later issue of THE CHEMIST.

## Niagara

*Chairman,* L. M. Lawton *Vice-Chairman,* George W. Fiero

*Secretary,* Margaret C. Swisher

Department of Chemistry
University of Buffalo
Buffalo, New York

*Council Representative,* Arthur W. Burwell
Carl H. Rasch, *Alternate*

## Pennsylvania

*Chairman,* Clinton W. MacMullen *Vice-chairman,* Glenn E. Ullyot

*Secretary-treasurer,* Kenneth E. Shull

23 Bala Avenue

Bala Cynwyd, Penna.

*Council Representative,* John M. McIlvain

## Washington

*President,* L. F. Rader, Jr.

*Vice-president,* Donald H. Andrews *Treasurer,* L. R. Heiss

*Secretary,* Ernest J. Umberger

207 Albany Avenue, Takoma Park, Maryland

*News Reporter to* THE CHEMIST, T. H. Tremearne

*Council Representative,* Albin H. Warth

## The Kilgore Bills

Mr. H. S. Neiman,
American Institute of Chemists,
New York City.

I am sending you a copy of a letter which I have sent to our Congressmen relative to the Kilgore Bill. I think that the INSTITUTE as an organization should protest loudly and point out to our Senators that the people of this country do not wish to have a totalitarian system of government imposed upon them. We do not want four freedoms. We are only interested in having one, since there is but one freedom and it embraces all that is worthwhile in life.

Sincerely yours,
M. L. Crossley.

Hon. W. Warren Barbour,
Senate Office Building,
Washington, D. C.

Honorable Sir:

The Kilgore Bill #S702 is an amazing document. Under the guise of mobilizing the Nation's scientific and technical resources it would create a totalitarian system of government which would enslave us all. The Bill appears to be based on several misconceptions.

In the first place, it assumes that our scientific and technical knowledge is unassembled and uncoördinated so that it is not useful in helping to solve the problems of war and in providing for adequate technological development in times of peace.

In the second place, it assumes that the scientific and technical organizations of the country have been unable adequately to appraise and plan for the application of technical data in industry.

In the third place, it assumes that some Federal organization could adequately appraise all scientific and technological information, coördinate it and employ it in a better way to promote the National interest than the scientific and technical forces which are now charged with this responsibility under our system of free enterprise.

Of course none of these assumptions is true. We have in this country the most effective scientific and technical organizations to be found anywhere in the world and the scientific and technical information has been adequately reported, indexed and made available for the use of science and technology. There is no monopoly of scientific and technical information and the scientific organizations in the country have been concerned with the problem of promoting scientific and technical education and of seeing that adequate knowledge of qualified persons would be available for carrying on the scientific and technological work of the country.

What does the Bill mean by "to promote interest in scientific and technical education and to provide for all qualified persons the means of scientific and technical training and employment". For the Federal Government to do this it would have to take over all of our schools, colleges and universities and, besides, would have to regiment us by planning the courses to be given by these educational institutions. Of course this is

impossible of accomplishment and undesirable if we are to maintain our democratic system of freedom in both education and endeavor. Science and technology must be free if they are to serve the country effectively.

The obvious intent of the Bill is not to aid the war effort but to set up a bureaucracy which will control all industry and all science and technology. This is clearly brought out in the fifth paragraph under "Declaration of Policy", in which the scope of the Bill is shown to embrace agriculture, manufacturing, distribution, transportation, communication, and other phases of productive activity. The Bill is not a temporary measure for the war period. It states very definitely that the provisions are to be effective in post-war peacetime.

The Bill is entirely impractical. There is no man capable of directing the efforts that would come under the Federal Board as set up in the Bill. I can not imagine a board of experts, however capable the individual members, who could appraise the usefulness of all scientific and technical knowledge and determine what facilities would be best to apply such knowledge in industry, particularly when all industry is involved.

The application of scientific and technical knowledge in the production of goods and service can best be done in specialized industries where manufacturing experience has been acquired. No one person would have the proficiency of knowledge and expertness required to guide a Board in determining what processes were best to employ in the several manufacturing operations. To think of such a Board apart from the industries involved determining such details as the proper design and synchronization of equipment for plants is too silly to receive serious consideration. The designs and specifications to be employed in the manufacture of drugs are not related to those which would be needed in the manufacture of electrical equipment for communications or in the mechanical equipment required for transportation. Furthermore, the problems that are involved are frequently complicated by local conditions the importance of which could not be properly assessed by a Board operating from Washington.

There is no need for us to change our democratic system of government as this Bill would do. Under our present system we have developed a high standard of living in this country and the benefits of research are enjoyed by all. The results that have been obtained in the research in technological laboratories connected with industry have been employed to produce the major things of our modern civilization. I need only to refer to a few of these to illustrate this point. The automobile is a modern device which was evolved out of the scientific and technological laboratories of the industries. The tires that were developed to give the public long service cost only a fraction of what they cost before accelerators and antioxidants were discovered by the research laboratories in the industries and the benefits of this research are reflected in the lower cost of these in serviceable tires so that the man who drives a cheap car derives the benefit to as great, if not greater, degree than the man who drives an expensive car. The great progress that has been made in synthetic textiles, resins, drugs, dyes and pigments illustrates what can be

accomplished under a free system of enterprise when science and technology are not harnessed by bureaucratic organizations controlled by politics.

So far as the availability of scientific and technical knowledge for the use of the Government in time of war is concerned, all who are familiar with the facts know that everything that we have is available for Government use. There is no knowledge, scientific or technical, that could be usefully employed in winning the war that is denied the Government. It is therefore not necessary for the Government to take over all property and enslave the personnel in order to enjoy the results of scientific and technological work.

The Bill provides that not only shall the scientific and technical work be controlled by the Federal Board but also that programs of research and development shall likewise be so controlled. This is ridiculous. Programs of research and development can only be as broad in scope as the proficiency and expertness of the men preparing them permit. I cannot imagine a group of men sitting apart from the industry involved preparing research and technological programs that would be efficient in the development of industry. Likewise, it would be unthinkable that such a group could assess the value of scientific and technical developments and bring to bear expert judgment on their application. Men must be able to appreciate the significance of results in order to assess their value and determine their usefulness. It is impossible to study paper reports from numerous laboratories doing unrelated work and assemble out of such data programs of work that will lead to the development of products essential to National welfare.

The scientific and technical developments of the past twenty-five years are only indicative of what we can expect after this war. The problems are so varied and so complex that no one organization could coördinate them and formulate a unified policy.

As I see it, this Bill would not only confiscate all knowledge and property but would put into the hands of the Government all the activities of industry and the personnel, scientific and technical, on which the industry depends. In effect the Bill would completely enslave the people of this country. Under the authority given by this Act everything that is essential in life would be controlled by the Government. We are fighting this war to defeat the philosophy of government which enslaves its people. We certainly do not wish to adopt the same philosophy of totalitarian government in place of our free democratic system which ensures the freedom of the individual to achieve any success which his capacity for service permits.

This Bill must be defeated if we are to retain our freedom.

Sincerely yours,
M. L. Crossley.

The Chemist,
233 Broadway,
New York, N. Y.

Regarding the Kilgore Bill, S.607, it apparently represents an attempt of the currently entrenched war organization to fix its present status by congressional law. This organization is still in a state of flux and exhibits many weaknesses contingent upon the hasty assemblage of personnel. Changes

obviously are required. Therefore, this Bill, which attempts to crystallize the present organization, should not be passed. As for S.702 (to establish an Office of Scientific and Technical Mobilization and to mobilize scientific and technical resources), this Bill is impractical, and moreover it would be impossible to make such a system work because it attempts to catch and imprison the spirit of research to the exclusive advantage of a government agency. A notable omission in this Bill is any protection for the originator and inventor, nor is there provision for experimental and research units except as demanded by political expediency. The director and personnel of this organization are either appointed by political powers or esconced in office permanently, without regard for the trained scientist who would not yield either to political considerations nor to the rules of the bureaucrats. No scientific freedom is envisioned.

We have considered, since World War I, some form of organization of scientists or of scientific information and its application to what is called "social uses" but this Bill does not give us such an organization. It implies that pressure can squeeze forth research results, which is an impossibility.

John A. Steffens, F.A.I.C.

The Chemist,
233 Broadway,
New York, N. Y.

In the February issue of THE CHEMIST, Dr. Gustav Egloff proposes that the Kilgore Bill on Technical Mobilization should be defeated. As a member of the legislative committee of The American Association of Scientific Workers, I am interested in the fate of the bill. (I'm neutral as of today), and I should like to see what other chemists think of this potentially powerful piece of legislation.

Personally, I am hoping that many of America's chemists and other scientists will band together to make themselves a factor in post-war planning. I mean, by this, that scientists, aside from professional politicians and diplomats, should have some voice as to how we can better feed, clothe, and house our own people and later others who live in distressed areas outside of the United States. We, who are so necessary in making "better things for living through chemistry" seem to be apathetic when it comes to seeing that everybody benefits by our work. Perhaps through the INSTITUTE, we can make an approach in organizing such action.

George Greenbaum, J.A.I.C.

Kenneth E. Glidden, F.A.I.C., informs us that he is teaching industrial chemistry to laboratory technicians of The Brown Company, Berlin, New Hampshire. The course, which stresses applications in the pulp and paper industry, is supervised by the chemistry staff of the University of New Hampshire and is part of the E.S.M.W.T. program. The majority of the students are young women of high school education who have replaced relatively experienced men who have gone into war work or the armed forces.

## Villanova College Convocation

Villanova College, at Villanova, Pennsylvania, celebrated the one hundredth anniversary of its founding on May 3, 1943. The outstanding event of the day was the Convocation, attended by delegates from more than 250 universities, colleges and learned societies, including the representative of THE AMERICAN INSTITUTE OF CHEMISTS.

Father Edward V. Stanford, President of Villanova College, welcomed the delegates and guests, and spoke briefly on the history of the College. Dr. William M. Lewis, President of Lafayette College, extended the greetings of the delegates. In the main address Dr. William P. Tolley, Chancellor of Syracuse University, spoke on the future of American education, particularly on the need for changing the pattern of education in the light of the experience gained in Government training of young people.

Honorary degrees were conferred upon twelve distinguished citizens including the Governor of Pennsylvania, the presidents of four colleges and universities, three officers of the armed services, two clergymen, a journalist, and a physician.

Arthur Osol, F.A.I.C., Delegate.

## Meeting Dates—1943

May 31-June 1—Canadian Chemical Association. Annual Meeting, Montreal, Canada.

June 3 — Manufacturing Chemists' Association. Waldorf-Astoria, New York, N. Y.

June 4-5—Synthetic Organic Chemical Manufacturing Association, Seaview Country Club, Absecon, N. J.

June 7-8—National Association of Insecticide and Disinfectant Manufacturers. Hotel Statler, Cleveland, O.

June 18-20—Society for the Promotion of Engineering Education, Drake Hotel, Chicago, Illinois.

Sept. 6-10—American Chemical Society. 106th Meeting. Minneapolis, Minnesota.

Oct. 13-16—Electrochemical Society, Inc., Hotel Pennsylvania, New York, New York.

Dec. 6-11—19th Exposition of Chemical Industries, Madison Square Garden, New York, N. Y.

Dec. 28-30—American Chemical Society. Organic Chemistry Symposium, Boston, Mass. Tenth National Symposium.

### Positions Available

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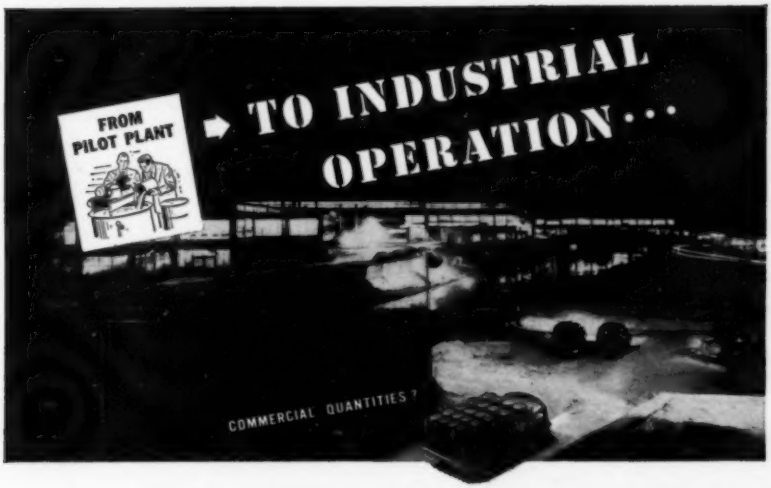


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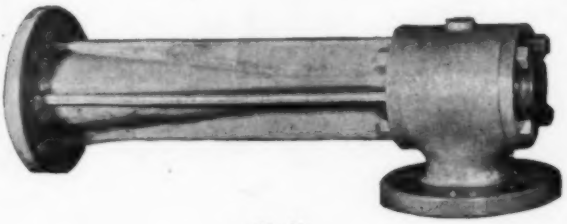

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